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Partnerships as a Major Strategy for Community College

Improvement:

A Case Study of a Community College Program

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Partnerships as a Major Strategy for Community College Improvement:

A Case Study of a Community College Program

by

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Partnerships as a Major Strategy for Community College

Improvement:

A Case Study of a Community College Program

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This case study's purpose was to provide other college administrators and faculty members, who are especially involved in community college workforce programs, an example of a program that partnered with many entities, including multiple business entities, and became one of the best in the country, in its particular field. The study alluded to the difficult realities that many high-technology community college two-year programs are experiencing in trying to offer updated and relevant programs in areas that are constantly changing and where facilities, equipment, and other requirements may be prohibitively expensive to implement. The study focused on a workforce program, the Austin Community College Semiconductor Manufacturing Program, and the benefits that it attained by partnering. The study utilized a qualitative research approach to acquire data to answer three main questions. The first question addressed who the program

partnered with, what were the benefits and the challenges, and who and when did what to create structures that then enabled successful implementation of various initiatives? The second question was to find what are essential success factors that are required to make any workforce program more successful, which partners had what effect on these factors, and how did the program rate relative to those same factors (according to the different partners)? The third question addressed what the program did to adapt to a different environment, and how did the department utilize partnerships to implement new strategies.

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Chapter One
Introduction and Purpose to the Study

American Current Events and its ties to the Community College

In 2004, the U.S. will spend more money on its military than Russia, Germany, England, China, France—actually, more than all of the combined world budgets. It will outspend all 191 countries and it will do it with only four percent of its GDP (Zakaria, 2003)! The U.S. produces 43 percent of the world's economic production, 40 percent of the world's high-technology production, 50 percent of its research and development, and it is achieving these phenomenal statistics with only five percent of the world's population (Zakaria, 2003).

These are phenomenal statistics that lead to the question of how five percent of the world's population has achieved so much. There are many reasons, but significant credit goes to the large diversity of industries that have prospered because of the talents of millions of Americans, many of whom got their college education or initial postsecondary education at a community college and, possibly even more important, are continuously retooling their skill sets at their local community college. This is supported by the fact that from 1990 to 2000, full- and part-time enrollment at two-year schools increased 13.5 percent, from 5.2 million to 5.9 million (National Center for Education Statistics, 2003). Further, community colleges have been tasked to cater to many segments of society; if a potential student does not have a strong academic background, community colleges test them in order to find the starting point they are at and then

provide a variety of remedial courses (if needed) so that they can reach a particular college program curriculum starting point and succeed thereafter. If a person has any type of learning disorder due to a variety of handicaps, the college typically provides special services to overcome those barriers. If a person does not have command of the English language to a desired level, a significant arsenal of remedial programs are typically available, a critical function that should exist in a country with a large and ever growing immigrant population. Partly because of these programs and other factors common to community colleges such as open admissions, relatively low tuition, and availability at many locations, large segments of our population including minorities have benefited. From 1990 to 2000, enrollment of underrepresented minorities at two-year colleges increased 65 percent (Tsapogas, 2004). If a person wishes to enroll in courses that transfer to a variety of bachelor degrees at universities, the colleges are usually very accommodating. If the person wants to learn skills for a particular job in a particular industry, community colleges have been leaders in this effort. However, in recent years, community colleges have experienced increased scrutiny in an effort to cut costs and operate more efficiently. Pressures have been mounting. Various accountability measurement standards and tools have been debated and imposed, and a significant source that makes these goals and tasks possible—funds—have been on a steady decline. The public wants more, but it wants to pay less. Unlike the U.S. military budget—which is to be increased by $50 billion for next year (Zakaria, 2003), community college budgets are decreasing and are being told to "produce" more so that Americans have more capacity to produce more for the nation, but with less money.

Historically, community colleges acquired their funds at close to three equal parts—from the state, local property taxes, student tuition, and sometimes additional contribution from the federal government. Today, the federal government component is even less. The states are cutting budgets because they are experiencing huge budget deficits. Local taxpayers are not supporting any tax hikes because many have recently lost their jobs or feel insecure with the current economic situation. Therefore, the only clearly visible alternative for community colleges is to increase student tuition. This action, at first glance, seems logical, but it contradicts one of the community college's fundamental axioms – access for all, including the ones who may not have the resources to pay for an education. When tuition is increased, some in our society are, in essence, disallowed to progress and become productive citizens that could otherwise have attained a decent standard of living. This research paper supports the idea that "the first glance" may lie and that much more can be done without having to raise tuition. This paper supports the idea that partnerships may be a significant solution to many of the challenges that the community college of today faces. Likewise, partnerships between community colleges and various entities may be a very significant part of the answer to educating our population at a high level of quality so that they can go work and preserve America's high standard of living.

Focus and Need for the Study

Community colleges are being asked to do more with less. With the American economy having suffered massive layoffs, the high-tech sector having experienced its worse downturn ever (2001-2003), it is no wonder that state appropriations for community colleges will most likely remain temporarily steady, at best. At the national level, local taxpayers—the other significant third of community college funding—are expected to be resistant to passing property tax hikes due to personal economic hardships. This leaves students as the obvious and exposed target to pay for the higher expenses needed to run the community college, especially expensive workforce programs. The problem is clear and the answer, to some, is also clearly wrong—to make students pay more. If students become the victims of large tuition hikes and/or reduced program offerings and educational quality, our nation as a whole will suffer. All of us ultimately benefit or pay for the condition of the nation and its people.

The community college is proud and honored to have the long-standing reputation of being the institution that does not discriminate on the basis of race or economic condition. It has the reputation of having something of value for almost everybody. It is known as a service organization built by the community to represent and serve that same community. It is also known for its wide array of academic and workforce development programs, and it is no doubt the place where we all can have a second or third chance through the community colleges' commitment to remedial education programs.

On the other hand, community college can raise tuition and do exactly what goes contrary to one of its dearest axioms, access, and/or it can cut programs and services and therefore endanger its educational quality, or it can look and attempt to excel through other alternatives. In the current economic crisis being felt by many, it is even more imperative for community colleges to learn what other community college programs have done and are doing and what successes and failures they have experienced.

Statement of the Problem

With community colleges facing budget shortfalls, some workforce training programs requiring extremely expensive equipment and facilities as technology changes, the large expense of hiring qualified faculty with relevant industry experience, and students and industry demanding that curriculums be more relevant to their needs, what can community colleges do? Some programs in technical areas such as semiconductors, wireless communications, robotics and automation, biomedical instrumentation, nanotechnology, and many others are extremely expensive to launch by any higher education institution, particularly community colleges that do not typically acquire funding levels comparable to research universities. Further, with technologies and techniques in many of these emerging fields evolving over periods of months versus decades, how and what can community colleges do if they want to offer high-quality curriculums in these fluid areas?

Purpose of the Study

The following case study revolved around partnerships between a community college, a technical program it offered, and the many collaborations that developed, especially with its many business/industry partners. The college is Austin Community College (ACC) and the program is the Semiconductor Manufacturing Technology Program (SMT). The purpose of the study was to find:

- who the partners were
- what benefits were attained by the parties
- how the partnerships first developed and how they then evolved and what was the order or sequence of events that led to the collaborations
- what are the "success factors" that lead to a successful workforce program (according to the different partners)
- to what extent did each of the partners have an effect on each of those "success factor" (according to the different partners)
- what did this program do to adapt to a changing environment with a different set of needs.

This study set out to find what happened, when, and who was involved. In addition, the study also found who in the scenario had the most effect on the different "success factors" that other colleges may be trying to affect. Similar challenges and questions are being confronted by many college programs, especially where programs are

new, wanting to be developed, and/or workforce programs that may at first glance seem prohibitively risky and expensive to create. Therefore, the study of this particular case may provide many with insights and a basis upon which they can build, copy parts that may apply to their situation, or avoid pitfalls that may have occurred in this case.

Research Questions

Research questions that were answered include:

1. Who partnered and in what order and what partnership structures were created to initiate and maintain the partnerships?
2. What benefits were attained for the various partners?
3. What were the success factors for making a high-quality community college workforce training program (the semiconductor program in this case) and what was their ranking according to all the partners, including companies, students, school representatives, and other groups?
4. Which partners had the greatest effect on each of the 'success factors,' according to surveys answered by the different participants.
5. When the needs of the served industry changed, what did the college do to adapt?

Significance of the Study

This study would assist in answering very important questions and challenges being addressed by community colleges across the nation, such as:

1) With community colleges facing serious budget shortfalls, can partnerships be a significant solution? With some workforce programs becoming prohibitively expensive, can partnerships be a significant solution?
2) If partnerships could be a significant solution to creating high-quality community college education programs, especially in some workforce development areas, who should administrators and faculty first contact and how should they do it? This is especially important in modern times as communities are increasingly dependent on local or regional economic development and community colleges are seen, in some instances, as major catalysts, or at least partially responsible for economic development.
3) Not all the "success factors" in this case study may apply to any other given community college program situation, but it is possible that some of them may. Further, understanding which partners had the highest effect on each of the "success factors" may be crucial to community college administrators because they can then focus on the partner types that yielded the most positive effect on the factors that they may be trying to address.
4) With technology changing ever more rapidly, the demands on community college programs are higher, the expenses are higher, and the risks are higher

because a need can change overnight. Given these potential realities, what did this program do to adapt to a changing environment with different needs and how does this potentially relate to other community college programs around the country that may be experiencing similar circumstances?

5) If we agree with the premise that an educated and competitive population leads to a higher standard of living (or at least maintains it), then it is imperative that our nation's community colleges utilize every possible asset in their communities and work together to achieve high-quality, constantly improving education and training. If the height of the challenges overwhelms us and forces us to say, "we do not do it because we can't" then we will have failed our nation, our students and ourselves.

The Context and Setting of the Study

Austin Community College and the Semiconductor Manufacturing Technology Program: A Historical Picture

The community college program under investigation is the Semiconductor Manufacturing Technology (SMT) program of Austin Community College. The program, started in 1995, offers an Associate of Applied Science Degree in Electronics Technology with a specialization in Semiconductor Technology, as well as a one-year Certificate Program in Semiconductor Technology. The program is recognized by other similar programs around the country as one of the best, if not *the* best, and is also known for having a strong connection with the local semiconductor industry and has been

highlighted in many articles and television programs, including the *The McNeil-Lehrer Report*. The SMT program was created in cooperation with local semiconductor companies and grew to an enrollment topping 500 students in 1998 when the industry was growing at astonishing levels because the demand for chips was growing faster than the supply (Frenzel, 2003). The program was created to train people for jobs as fab operators and equipment maintenance technicians (Frenzel, 2003). The program later focused less on operator training and more on technician and technologist training to cover a wide array of functions and industries to make it more appealing as the semiconductor industry experienced its worst downturn ever. Focus was placed on training for equipment and maintenance technicians, process technicians, and later automation, robotics, and other related areas.

Austin Community College is a relatively large college with seven major campuses and many satellite training facilities. Its enrollment has grown significantly, partly because state deregulations have caused tuition at other universities to skyrocket. Austin Community College's enrollment has increased as follows:

Enrollment at Austin Community College

Fall 2000	25,856
Fall 2001	27,577
Fall 2002	>29,000

(Austin American Statesman, May 31, 2004).

The above table shows that enrollment increased more than 12 percent in just two years. However, it must be noted that the actual number of individual students who take at least

one course at ACC within a year is much higher; ACC serves more than 70,000 separate individuals a year who may be full-time students or may simply have taken one course within the year. A similar situation exists at the state level. Partly due to community colleges' relatively low tuition when compared to many universities, more and more students are attending them because that is all they can afford. The table below illustrates how Texas public community college enrollment for freshmen and sophomores has been much higher than at public universities and the percentages are getting higher for community colleges.

Enrollment at Texas' Public Schools

Freshmen

	Universities	Two-year Institutions
Fall 1999	83,600 (23.1%)	278,083 (76.9%)
Fall 2003	94,789 (21.8%)	340,870 (78.2%)

Sophomores

	Universities	Two-year Institutions
Fall 1999	61,450 (37.5%)	102,463 (62.5%)
Fall 2003	73,300 (34.8%)	137,152 (65.2%)

(Data acquired from Austin American Statesman, May 31, 2004, their source was the Texas Association of Community Colleges; does not include enrollment in health-related institutions)

The numbers above are astonishing to some and show that in Texas, the community college is extremely important to the future of the state as it shows that in the Fall of

2003, 74 percent of all freshmen and sophomores that attended a public higher education institution were enrolled at a community college! These numbers further show the responsibility and challenges that community colleges have accepted.

Austin Community College statistics, including financial data
Semiconductor Manufacturing Technology Program Enrollment, Graduation Rates and Placement Rates

Central Texas: A 1990's High Growth and High Technology Region

The city where this program is housed is very important because it did affect the ease with which the partnerships were created; the more companies in existence, the higher the probability of making more partnerships. The city of Austin, Texas developed a reputation as being a major semiconductor production center in the U.S. as some of the largest semiconductor-related firms such as Motorola, AMD, Applied Materials, Tokyo Electron, SEMATECH, Cypress Semiconductor, and Samsung set up manufacturing centers in the 1990's. Most of the large, higher-paying firms were semiconductor related companies (one of every four high-technology jobs in the region was semiconductor). There were also other major manufacturing employers in the area, including Dell Computers, Abbott Labs, National Instruments, Solectron, and 3M. Austin also benefited by other firms that provided and/or created a myriad of other products or research such as IBM, Intel, Silicon Labs, and a multitude of software companies. The fact that Austin had many high technology firms and/or was in the process of attracting them to the region in the 1990's should be of interest to other colleges who are in the process of

creating high-technology programs. The abundance of potential employers made the convergence of partnerships and resources much more available and accessible. That is not to say that their absence would eliminate the possibility of partnerships and economic development, but it would make it more challenging.

Definition of Terms

The following are definitions to terms used in this case study:

SMT – Semiconductor Manufacturing Technology Program, a program designed to train people for technician jobs in the semiconductor industry or could apply to other industries (focused on Process Technicians and Maintenance/Equipment Technicians).

FAB – Semiconductor Chip Factory, Austin, Texas had a number of operating FABS at the time of this research, especially the first few years of it in operation. These fabs convert disks (wafers) made of silicon (purified sand) into all kinds of chips (microprocessors, memory, etc.). A FAB in 2000 costed between 1.5 and 2 Billion Dollars to build, in 2004 they cost between 2.5 and 4 Billion dollars.

Maintenance Technician – Technician responsible for maintaining the equipment and machines running; troubleshooting skills essential, as well as a strong electronics, hardware, and software background. These positions were very highly paid in some semiconductor firms as it became known that some of these technicians commanded annual pay between $40,000 and over $100,000.

Equipment Technicians – very similar job descriptions and pay scales as Maintenance Technicians in the semiconductor industry.

Process Technicians – Technician responsible for working with Process Engineers to maintain and improve the number of products (chips) that passed manufacturing successfully versus failed due to manufacturing and/or design flaws. They also commanded relatively high salaries and were in high demand in the early to late 1990's. Demand flattened but continued as the semiconductor took a downward turn.

Fab Operator – Semiconductor Factory Employee who transport and track wafer lots as they are being processed throughout the fab. They must have a basic understanding of the machines and the process in their area but they are not as well versed about the technicalities as are the technicians. /

Technologist – A position with a more ambiguous stature and responsibility, depending on the firm that hires them. They tend to be hybrid positions requiring job functions performed by both technicians and engineers. It is the belief of the author of this study that the technologist position will become more common as technicians are expected to know more and do more technical functions and engineers are also expected to perform more traditional technician functions (maintaining and troubleshooting vs. researching, studying, simulating, implementing, testing, and other more traditional engineering functions).

Nanotechnology – the area of making very small devices at the ten to the minus nine meter level. It is a multidisciplinary area involving Electrical Engineering, Mechanical Engineering, Physics, Biology, Chemistry, and other fields. It is somewhat associated to the Semiconductor Industry.

Biomedical Instrumentation – an area that trains technicians that fix and maintain the equipment used for medical applications such as in hospitals and clinics.

Limitations of the Study

Like other case studies, this case study has many limitations and points of caution. Because data were acquired by actual partners (participants in the case), the data may have some exaggerations or some facts may not have been mentioned by some participants. Therefore, careful attention was placed to avoid this situation by interviewing many partners who had different motives and involvements; however, the data were scrutinized by using research methods like triangulation and circling to minimize the possibility of false or flawed data. Nonetheless, the author acknowledges the possibility of discrepancies between every piece of data that were acquired and the reality that actually occurred; there may be small differences as is inherently possible in a qualitative study. More on this point is addressed in the limitations section of Chapter 2. Further, it is important to mention that the author of this study was the Department Chair

of the Semiconductor Manufacturing Program at the time that the research was done. Therefore, some participants may have been more inclined to provide a more positive light to questions so as not to hurt relationships with the Department Chair, the college, other companies, or other organizations that were also partners; the author made the questionnaires anonymous, stated that all information was to be held confidential and to be reported only as an aggregate, and encouraged honesty from the participants to insure the integrity of the data. Other limitations in the study are that the study was a case study—a study of a particular case, in a particular place, at a particular time, in a particular technical workforce area. The author believes that the case results should be reviewed by other community college administrators and faculties in order to assist them in improving their programs by looking at others, but to be cautious as to the individual relevancies to their program(s). Other limitations are that the case program being studied was a workforce program, and therefore, replication by other programs, especially traditionally academic programs, is suspect.

Chapter Conclusion

The purpose of this chapter was to present the purpose, scope, and reasons for this case study. The purpose was to perform an analysis of a workforce program at a particular community college that experienced high success by utilizing partnerships with many entities, especially businesses and industry. The case study attempted to find what led to partnerships and what the benefits were to different parties. Further, the case study proposed to find what the "success factors" or the "success elements" were that made the program successful and yielded mutually beneficial outcomes by the partners. The report would also find which partners had what effect on these different "success factors," according to the survey participants. Finally, the report would find what the college and program did to adapt to changing conditions, as they were involved in a high-technology workforce program—programs involved in technologies that are changing in months, not years, and involved in industries that likewise change constantly.

Chapter Two
Review of the Literature

Partnerships: The Call to Partner

> *If two-year and four-year colleges are to improve their programs in a time of expanding enrollments and declining resources, then it will be necessary to find new ways of raising money and sharing resources across institutions. This approach of sharing resources via cooperative programs, consortia, and partnerships with other educational institutions, government agencies, and business industry offers an excellent way for colleges and universities to achieve more, do something better, or reduce the cost of their activities. (Neal, 1988)*

"In today's uncertain world, it is best not to go it alone" (Ohmae in Roueche, 1995). This is definitely a remark known to the business world but slowly becoming prevalent in the community college world. The concept of partnership has been encouraged and used by educational institutions for many years. For example, in 1892, Harvard University developed partnerships to improve teacher preparation, develop better articulation agreements between secondary and postsecondary sectors, and for sharing resources (Beauchamp, 1995). More recently, highly publicized reports such as *A Nation at Risk* (National Commission on Excellence in Education, 1983) and *Building Communities: A Vision for a New Century* (Commission on the Future of Community Colleges, 1988) have recommended that institutions of higher education place more efforts on partnerships to enhance the learning process. For example, the report *Building Communities: A Vision for a New Century* states: "partnerships with employers for the training and retraining of the community's workforce must be recognized as an important

component of the continuing education program in community colleges. We urge that alliances with employers be carefully integrated into existing community college programs and interests" (Commission on the Future of Community Colleges, 1988). In 1990, Dale Parnell, President of the American Council on Education, in *Dateline 2000*, made a call for urgent change in the community college world. He insisted that community colleges develop partnerships with city, local, state and federal governments, the local communities, four-year educational institutions, and with the business world. Similar remarks were made by others such as Lawrence Davenport who stated: "a vast and relatively uncharted opportunity in sharing resources is the whole area of partnerships: not only the traditional ideas of business/industry/education partnerships, but also partnerships between community colleges and K-12 districts and between four-year institutions and community colleges. Through these partnerships resources can be more effectively directed toward excellence in education, as well as adding technology and community concerns such as maintaining industries or attracting new industries to the area" (Davenport, 1989). Paul Elsner, Chancellor of the Maricopa Community College District, stated: "a new sense of connectedness and collaboration must be cultivated and, eventually, subsume the old separatist strategies" (Elsner, 1993). The resistance to partnerships is well documented. "The principal impediment to effective interinstitutional cooperation is the traditional commitment of colleges and universities to institutional autonomy" (Patterson, 1974, quote in Smith, 1999). John Roueche, Director of the Community College Leadership Program at the University of Texas, stated: "in our local and global economy, we as individuals, as colleges, and as community entities (no

matter the size) cannot function in isolation; we are all inextricably interlocked in the human enterprise. Observers of the complexities and the varieties of this enterprise agree that 'success comes not just from what you know but from who you know" (Kanter, 1994). Indeed, we are now and will always be known by the company we keep" (Roueche, 1995).

Partnerships: The Call is Being Said and Heard, by Some

> *Partnership has been the cornerstone of community colleges' operations, and particularly so in the community services and continuing education aspects. Partnerships with business and industry, with four-year institutions, and with other community-based organizations and agencies have made community colleges the community's college. (Tsunoda, 1989: Joyce Tsunoda, Chancellor for Community Colleges in Hawaii)*

Community colleges are realizing more and more that partnerships with various entities may be the best way to succeed by better serving their students and their communities. In *The Role of the Community College in Building Communities Through Coalitions*, Janet Beauchamp (Beauchamp, 1995) quoted Paul Elsner, Chancellor of the Maricopa Community College District:

We have not been able to solve our problems within existing institutions, so it seems appropriate that we draw out the best ideas and innovations to create a new institution that represents the self interests of the rest. In doing this we will have represented the best thinking and resources, as well as the greatest problems and issues, to solve collectively. It is through community conversations that we can shift our focus

from turf isolation to community building. This is not only possible, but it is happening—in small, but significant, ways throughout our nation (Elsner, 1994).

Flora Mancuso Edwards, President of Middlesex County College in New Jersey, was explaining why their college had been so successful and stated: "…as we prepared to define our role of the 90's, it became apparent that we must look beyond our own walls; that if we were to succeed we must re-examine not only the educational enterprise itself, but the partnerships upon which it is founded. Simply put, a community cannot be built if the key players are not at the table" (Edwards, 1989). Carl M. Kuttler, Jr., President of St. Petersburg Junior College in Florida who has been very involved in partnerships stated: "St. Petersburg Junior College knows one simple truth—no partners, no posterity" (Kuttler, 1995). William Wenrich, Chancellor of the Dallas County Community College District, states that they are even using formal TQM techniques to insure that customers such as Texas Instruments are being taken care of fully; he states:

"Through this evolutionary process, TI has used TQM as its mechanism for change and has come to think of educational providers such as DCCCD as suppliers, expecting the district to work with them in more systematic ways to meet their educational and training requirements. In effect, TI now asks DCCCD to treat it as a customer, requesting that the district work closely with them as a partner to help ensure the quality of their workplace…DCCCD has worked hard to maintain a responsive, positive relationship with TI: developing specific technical programs to accommodate technician training needs, setting up an array of advisory committees, responding to discrete contract training requirements, working out cooperative learning opportunities

for students, and supporting professional development opportunities for faculty needing to stay current in technical fields" (Wenrich, 1994).

Other schools have used "cooperative apprenticeships" to connect with their partners. Jeffrey Cantor conducted a study involving various colleges involved in this practice and stated: "A significant benefit derived from linkages between apprenticeship and technical education is the facility and equipment loans, donations, and sharing of results. Automotive manufacturers are reported to have donated equipment, training aids, and materials to participating colleges. GM training management reported that its donations in vehicles, including tools, and parts total $20 million a year on average" (Cantor, 1995). Norm Nielson, President of Kirkwood Community College in Iowa stated a similar view: "the key is to find some friends. Make those friends partners. Then find more friends. We must be willing to build key relationships to address the important needs of the community. Partnerships are the door to our future" (Nielsen, 1995).

Partnerships Commit the Community College to Their Community

> *Many leaders of historical renown and many contemporary leaders of traditional institutions succeeded by focusing on the needs of their own organization and by being the best advocate for the interest of their own group. They could attract resources to their institutions and then defend its borders, drawing sharp distinctions between insiders and outsiders, 'us' and 'them,' and keeping outsiders at arm's length…Leaders of the future can no longer afford to maintain insularity… In short, leaders of the past erected walls. Now they must destroy those walls and replace them with bridges (Kanter in The Leader of The Future, The Drucker Foundation, 1996).*

The Webster's II New Riverside Dictionary (1988) defines "partner" as: "one who is associated with another in a shared activity; an ally. In the context of community colleges, this definition can be expanded to anybody or any group in the community who can mutually benefit from a relationship. A more specific definition is "a combination of people, groups, associations, or organizations that have joined for a particular purpose. A consortium may be assembled to accomplish a single, short-term purpose, or as a semi-permanent alliance to pursue a number of ongoing purposes" (Shafritz, 1988). Such partnerships may include a large variety of entities with varying degrees of specificity. Partnerships have allowed many community colleges to acquire various forms of resources that they otherwise may not have been able to get. In addition to acquiring needed resources (for example, money, scholarships, equipment, facilities, instructors, advice, jobs, internships, and others) to develop excellence in education, partnerships nurture more accountability between the community college (program) and the partners with whom it works. Partnerships can also influence what is taught, where it is taught, when it is taught, why it is taught, and how it is taught; such influence varies and in many cases is negotiated by the different members in the partnership. Mr. Davis (1994), co-author of the *Monster Under the Bed* stated at a community college leaders conference, "if community colleges fail at this task (that colleges must adapt to a new environment by becoming more consumer-oriented, flexible, and accountable)…they will risk losing many of their students and much of their public support" (Schmidt, 1998).

Partnerships Can Also Have Philosophical and Practical Negative Effects

> *It should not be surprising to either partner that their priorities oftentimes might be quite different. This does not mean, however, that the collaborative effort needs to suffer. (Maiuri, 1989).*

Philosophical Concerns

When a partnership is made, commitment to a benefit for all members must be agreed upon, for the partnership to survive. However, many times, partners have differing viewpoints and agendas on how to guide a partnership and its outcomes. Harriet Gurian Freidstein, member of the College of Education of the University of North Texas and of the North Texas Consortium of Junior and Community Colleges, stated: "Organizations that enter into collaborative agreements give up a certain amount of autonomy and control over outcomes. To a certain extent this is necessary if the projects are to take imaginative directions" (Friedstein, 1995). She later adds, "On the one hand, local communities are demanding greater services from community colleges, and on the other hand, taxpayers have said they cannot afford to pay for the education they want. The colleges have expanded their services the best they could and have been innovative and entrepreneurial. Even with the most creative structures and innovative programming, however, colleges cannot function as solo providers of education. Consequently, they have turned to partners in new arrangements" (Friedstein, 1995). At issue is the possibility that business and industry will eventually control the who, why, where, when, and what is taught. This possibility is at the center of discussion in the classical case of the continuing philosophical struggle in higher education between offering a more

applications-oriented curriculum (hands-on training that is more practical, technical, and work-oriented) versus a more traditional liberal arts curriculum that focuses on a broader, less specific education that can be applied to many situations in life (Greenwood, 1988; Anderson, 1988). This philosophical argument is important to consider because some criticize relationships between education institutions and business/industry because they claim that such partnerships lead to vocational types of programs and curriculums that limit the prospects of students and their futures. It is also argued that many students may be "routed" to certain programs with limited standard of living outcomes. Greenwood (1988) states that this debate centers on "whether vocational education was designed as a liberating force to assist young people to be in charge of their own destinies or as a socially controlling force designed to keep certain young people at lower rungs of the occupational ladder" (Greenwood, 1988). For some people, vocational programs have a negative connotation. For example, some people connect any vocational/workforce-oriented program to adjectives such as "shop" (Anderson, 1988). The Unfinished Agenda report of 1884 stated that within secondary schools, vocational education programs are generally perceived as low status programs by the better students, many teachers and counselors, and the general public. This perception was shaped in large part by vocational education programs' attracting students who are either unable or unwilling to succeed in traditional academic courses. This report also stated that the perception was that vocational education students tended to have low achievement records, low occupational aspirations, and low achievement motivation (Anderson, 1988). Even with some negative perceptions, many favor the idea of business and industry being "the

driving forces" (Doug, 2001). Roueche, on the other hand, highly supports partnerships between the community college and other entities but still recommends a careful balance between what is good for a company (for example) and what is good for the student. Roueche states:

"to serve private priorities while neglecting social obligations is, ultimately to undermine self-interest…it warns against making too great a distinction between careerism and the liberal arts, between self-benefit and service. We more comfortably embrace the notion that the aim of the undergraduate experience is not only to prepare the young for productive careers, but also to enable them to live lives of dignity and purpose; not only to generate new knowledge, but to channel that knowledge to humane ends, not merely to study government, but to help shape a citizenry that can promote the public good" (Roueche, 1995).

Practical Concerns

Another challenge for partnerships is the level of representation that should exist. From a democratic perspective, all that are affected should be involved, but from the perspective of a community college program, for example, if too many entities are involved, democracy is upheld but action and tangible outcomes may be difficult to achieve because of the differing viewpoints and possible areas of contention.

To probe deeper into the area of partnerships, this study focuses on a sample of partnerships in which a community college program was involved. The partnerships are described, together with outcomes, benefits, and points of contention or disadvantages, if they existed.

Chapter Conclusion

This chapter provided evidence that partnerships are being encouraged by multiple national reports written to improve higher education, together with examples of partnerships that have occurred and benefited the groups involved. Previous partnerships provide much evidence that factors such as funds, materials, and curriculums can be enhanced via these arrangements. Partnerships also commit community college programs to the support and success of their constituents, including business partners. However, partnerships also have drawbacks. Partnerships can sometimes slow the pace of progress and decision-making, especially as the number of partners and individual needs increase. Further, debate exists over the possibility that partnerships with business/industry may be compromising the quality of a well-rounded education by emphasizing specific skill sets over more diverse and general education curriculums.

Chapter Three

Methods of Study

Chapter One depicted some of the challenges that community colleges are experiencing in trying to do more with less funds. State governments under enormous economic pressures are lowering college allocations or leaving them the same. Concurrently, the public is hesitant to increase any tax rates because they are also under pressure as the economy is weak and unemployment rates are relatively high compared to a decade ago. Such conditions have left colleges with enormous challenges that may, however, be alleviated with the utilization of partnerships. Chapter One introduced the research questions of how a particular program partnered, who was involved when, what structures were created or evolved to successfully create and sustain an expensive workforce program, what were the benefits and challenges derived, which success factors were highlighted as critical to any workforce program and which partners had what effect on these same factors. Chapter Two provided a review of the literature with regard to partnerships between community colleges and various entities and provided insights into potential benefits and drawbacks. Chapter Three presents the research methodology that was used in the study. It also presents the rationale, study design framework, data collection methods, data analysis methods, and the limitations of the methodology that was used.

Methodology and Rationale

Because the purpose of this document was to investigate the who, what, where, when, and how a particular program at a particular community college successfully developed and implemented multiple partnerships that yielded many donations in many forms and that many people from many organizations were involved, it became apparent that the case study type of research would be the most appropriate. The program studied was praised for its success in acquiring significant donations in many forms from different organizations and using them to become one of the premier programs, if not the most premier program in the country, for its particular area of study. The case study type of research, a form of qualitative research, was favored because it enabled the researcher to incorporate information from interviews, documents, observations, and the environment that at times can be lost in non-personal quantitative instruments such as surveys. The case study approach to research enables the researcher to "bring a case to life in a way that is not possible using the statistical methods of quantitative research. Thus, readers of case study reports may have a better basis for developing theories, designing educational interventions, or taking some other action than they would have from reading only quantitative research reports. Also, thick descriptions help readers to compare cases with their own institutions" (Gall, 1996). Likewise, Patton states that case studies provide researchers the capacity to find information that "cannot be fully captured and measured along standardized scales" (Patton, 1990). Gall states, "one of the main characteristics of qualitative research is its focus on the intensive study of specific instances, that is *cases*, of a phenomenon…one goal of cases studies—in some studies,

the only goal—is to develop an understanding of a complex phenomenon as experienced by its participants. In other words, the researcher must figure out how to view the phenomenon as the participants view it" (Gall, 1996).

Study Design Framework

Naturalistic Inquiry

The case study research methodology incorporates naturalistic inquiry in that the researcher has the opportunity to experience a more complete understanding of the particular phenomena under investigation and its changing environment. Patton states that in the naturalistic inquiry method, the "researcher's role is to gain a holistic overview of the context of study" (Patton, 1990). Patton further states that through such method, the process and impacts are studied as they happen "naturally." Lincoln and Guba further state that naturalistic inquiry is a qualitative method that could be used within a case study where realities are multiple, constructed and holistic; the knower and known are interactive and inseparable; the working hypotheses are time and context-bound; the entities are in a state of mutual simultaneous shaping; and inquiry is value-bound (Lincoln, 1985). The case study investigated in this document fits these requirements in that there are many realities, "knowers" and possibly "knowns," the entities are always in a state of flux, and the nature of the study is value-bound because the researcher and the participants are human beings and, therefore, value-bound in their descriptions, beliefs, perspectives, and responses.

Grounded Theory

The results of this study needed to be based on what was learned from documents, interviews, and observations. Danger of yielding incorrect results is always present when major conclusions are drawn before the research is done. Therefore, strong attention was paid to grounded theory. Gleazer and Strauss noted that in naturalistic inquiry, theory should be the result of data and not the other way around (Gleazer, 1967). Patton stated that theories that are yielded should be "grounded" in "real world patterns" (Patton, 1990). Henwood and Pidgeon stated that grounded theory is a valid tool because it alerts researchers to the possibility of 'reproducing pre-existing perceptions, ideas, and concepts' (Henwood, 1995).

Inductive Analysis and Emergent Data

The qualitative approach to research utilizes inductive analysis to derive outcomes and conclusions. According to Patton, inductive analysis enables the researcher to derive patterns or conclusions without being biased by preexistent beliefs or expectations (Patton, 1990). Likewise, information and data "emerges" (emergent data) from the research that is performed, whether it be by observation or other forms of research (Patton, 1990). Various tools, such as coding and sorting of the data gathered, can assist in insuring that data "emerges" from the research rather than from preconceptions. Given the potentially many preconceptions placed on a topic by a researcher, a sound research strategy is to allow the research data to influence heavily the outcomes of the study.

Instrumentation

The instrument used to do the research was the researcher. The researcher was an Associate Professor for the Semiconductor Manufacturing Technology Program when some partnerships were initiated; other partnerships were initiated before the researcher joined this organization. During the research, the researcher had been promoted to full Professor and then to Department Chair of both the Semiconductor Manufacturing Program and Department Chair of the Automation, Robotics, and Controls Program. These positions enabled the researcher to access information and people that may have otherwise been more difficult. This fact also enabled the research to be done from somebody from within the organization who had a more in-depth understanding of the issues that were being analyzed. The instrument (researcher) had the advantage of having both more historical and deeper understanding of the issues but had the disadvantage of possible biases or preconceptions. The researcher was not only performing the research, but was also an active participant and employee of the program during this process. Lincoln and Guba warn against the possibility of "going native" (Lincoln & Guba, 1985) when the researcher gets too attached to the situation or the environment under investigation; in this case the researcher was a native of this environment, and, therefore much careful thought and attention had to be placed on how the research would be performed and assessed to reduce the possibility of bias or incorrect conclusions.

Data Collection

The methods used to gather data involved review of the literature, interviews, surveys and observations, and the review of documentation and records. The review of the literature on partnerships between schools and especially businesses was performed and presented in Chapter Two.

The interviewing portion of data gathering involved multiple interviews of different vested groups, some of whom were from within the college and others from the outside. A preliminary set of questions was created and tested with a group of students, faculty, and personnel from industry to see how well it made sense and would answer the questions to be addressed in this paper. That process yielded a revised version of questionnaires and surveys that are included in Appendices A and B. The participants to the actual study included the following groups:

1. Workforce Vice-President, first Department Chair, Director of School Foundation, department student advisor, and other college personnel
2. Semiconductor Industry Advisory Board Members (business people more associated with the details of the program)
3. Semiconductor Executive Council Members (business executives more involved in the long-term direction of the program)
4. Previous and Current Students
5. Current Semiconductor Industry Employers
6. Chamber of Commerce – Capital Area Training Foundation

7. Capital Idea – Workforce Development Program
8. SMT Program Faculty

This method also involved observation; observations were performed at a multitude of meetings between school personnel and its business partners. At these meetings, comments were made, strategies were developed, expectations were set, and action was implemented and measured.

The third method used to gather information was reviewing documentation such as program and school documents on enrollment, donation amounts, donation types, lists of companies involved including the persons and their titles at their respective organizations, student placement information, scholarship money origination documents, meeting minutes, historical calendars depicting emphasis and effort towards these partnerships, newspaper clippings, television programming related to these partnerships, and other relevant documentation.

Data Analysis Methods

Qualitative inquiry involves gathering information and then analyzing it into useful information. Therefore, once information is gathered, it has to be analyzed, interpreted, and presented (Patton, 1990). Tesch listed three approaches to analyze case studies: interpretational analysis, structural analysis, and reflective analysis (Tesch, 1990). Interpretational analysis involved a process of reviewing case study data "closely in order to find constructs, themes, and patterns that can be used to describe and explain

phenomena being studied" (Gall, 1996). Interpretational analysis involved tools such as coding and grouping into categories to make conclusions; structural analysis was very similar in that it involved a process of reviewing case study data for "the purpose of identifying patterns inherent in discourse, text, events, or other phenomena" (Gall, 1996). According to Patton, "the challenge is to make sense of massive amounts of data, reduce the volume of information, identify significant patterns, and construct a framework for communicating the essence of what the data reveal" (Patton, 1990). However, reflective analysis did not require explicit procedures like interpretational and structural analysis; but rather relies on "intuition and judgment in order to portray or evaluate the phenomena being studied" (Gall, 1996). The method chosen to perform the case study type of research would be a combination of all three in that stringent procedures such as coding and triangulation would be used to induce meaning and to validate some data but also intuition and judgment would be used to inject another level of personal analysis consistent with qualitative research.

Coding the Data

Coding is a process used to organize data for analysis. There are many types of coding processes (Gall, 1996). Guba states that a problem is figuring out what "fits together;" he suggests placing field notes and observations into systematic categories of analysis…by looking for "recurring regularities" in the data that then can be used to sort it (Guba, 1978). "The naturalistic evaluator works back and forth between the data and

classification system to verify the meaningfulness and accuracy of the categories and the placement of data in categories" (Guba, 1978).

Triangulation

Triangulation is the process of "using multiple data-collection methods, data sources, analysts, or theories to check the validity of case study findings. Triangulation helps to eliminate biases that might result from relying exclusively on any one data-collection method, source, analyst, or theory" (Gall, 1996). Denzin stated: "no single method ever adequately solves the problem of rival causal factors…because each method reveals different aspects of empirical reality, multiple methods of observations must be employed. This is termed triangulation" (Denzin, 1978). Therefore, the method of triangulation was used in this research study by incorporating data from the interviews, documentation that was acquired, and from the literature on the topic. In addition, triangulation was also used within each of the sources of information. For example, triangulation was used to compare data between the different persons that were interviewed or between the different documents that were acquired.

Circling

Circling "is the process of taking data or information collected from a single source and running it back around your circle of contact for refutation or confirmation" Guba and Lincoln, 1981). Circling was utilized with some participants from each of the interviewed categories listed in Appendix A to insure the validity of the data.

Methodological Limitations

The case study approach to qualitative research has many advantages over purely quantitative research, but it also has its limitations. One disadvantage is the difficulty in generalizing the findings to all other cases. Further, qualitative research can be biased because the researcher and the subjects may also be biased. Researchers can become too attached to the situation, environment, or the people in the study and hence become biased. Researchers can also inadvertently be selective in what they hear and ignore what they do not want to hear or see. If computer systems with no artificial intelligence were interviewing and studying other computer systems with no artificial intelligence, then this would not be a problem. However, any time a human being is involved in any part of interaction, different emotions, biases, and views will arise.

Chapter Conclusion

This chapter explained the reasoning behind choosing the case study approach of qualitative research to perform the study. It highlighted the strengths of using this approach over other quantitative approaches, but also listed some of the limitations to it. The chapter explained the design framework for the study and mentioned naturalistic inquiry and grounded theory as the preferred approaches to the study. The chapter reviewed interpretational analysis, structural analysis, and reflective analysis and described the method to be used as a combination of all three. It also highlighted the importance of inductive analysis and emergent data. The chapter listed the instrumentation to be used in the study, the different types of data collection techniques that were used (review of the literature, interviews and observation, and review of documentation), and the data analysis methods that were used.

Chapter Four

Study Results Part 1—The Birth of the Program, the Partnerships that developed and the Benefits That Were Attained

The Birth of the Program

The following is a slide presented at an Advanced Micro Devices (AMD) meeting in the mid 1990's; the slide highlights the need that existed for semiconductor-related skilled employees in the mid 1990's:

The Challenge

- **AMD needs about 150 wafer fab techs annually; requires 480 applicants**
- **Austin can absorb 800-1000 techs per year**
- **Enrollment in tech schools still lagging**
- **Fierce competition nationally and locally**
- **Costs 10X more to hire from outside area**
- **Relos have no ties to Austin**

Courtesy Alyssan Peerman, AMD, Corporate Manager, Community Affairs

In the mid 1990's, the need for skilled employees was high and an increasing number of companies were moving or expanding into Austin. Employees were brought from other parts of the country, and they tended not to be long-term, as many would eventually quit and move back to the communities from which they came. These employees from other parts of the country were also expensive to lure; companies typically offered bonuses, all moving expenses paid, higher titles and pay scales, and a long list of employee benefits. Finding qualified employees became so difficult, that

many companies were lured into hiring from the other companies; it was not uncommon for a headhunter to call individuals at work to try to get them to work for the company down the street. Companies were ramping production to record levels but simply did not have the people to operate the machines, repair or maintain the machines, evaluate the production processes that occurred within the machines, or a myriad of other job functions required for the production of microchips and equipment. It was the perfect scenario for a well-trained employee but not for the companies that needed them and not for everybody else in the community who wanted to be part of the successes of these companies but were afforded no opportunity or educational pathway.

The need for qualified employees was exaggerated when other firms such as Samsung and Tokyo Electron arrived in Austin; qualified employees were scarce and the competition for them was getting more fierce. Therefore, companies knew that something had to be done to address this major employment problem. Part of their solution was to create, develop, and maintain an SMT program at the local community college.

In 1994, AMD and SEMATECH initiated meetings to discuss the possibility of creating an SMT program at Austin Community College. They agreed that such a program would help alleviate the employment problem, help them, and assist people in the region by providing them the opportunity for an education that would get them relatively high-paying jobs. They then approached Austin Community College, and the college enthusiastically agreed. Many other companies had also been working on various workforce development initiatives, but they were implementing them largely

independently and so no comprehensive and coordinated effort existed. By late 1995, many other companies were joining this project collaboratively. Some of those companies included Applied Materials, Texas Instruments, and Samsung. In addition, organizations such as the Capital Area Training Foundation (an arm of the Austin Chamber of Commerce) were getting involved and were implementing various strategies to coordinate activities and successfully develop workforce development systems. By late 1995, a curriculum had been developed, an industrial-style training facility had been built, and many students were enrolled in the program. By 1996, the program had surpassed an enrollment of 500 students! Many of the faculty were adjunct (part-time) and also worked for the industry. An abundance of internships, scholarships and job opportunities was available for students. The program was perceived as a huge success by the business partners, the local community, the community college, and the students alike.

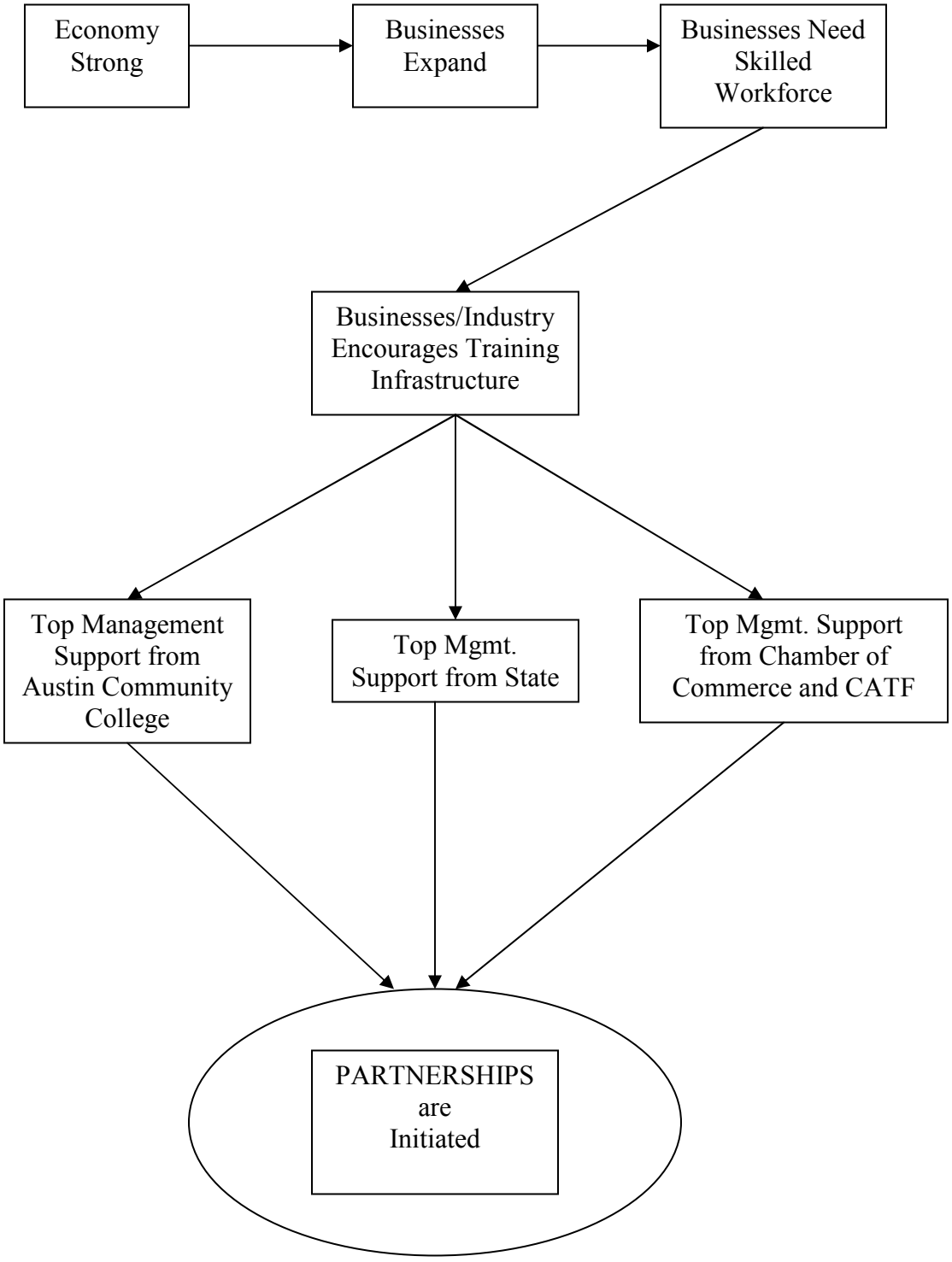
In addition to all the successes, there were also challenges for Austin Community College. For example, as the Associate Vice President of Workforce, Mike Midgley, who was deeply involved in the early creation of the program stated:

> ***"…additionally, this experience has allowed the college to grow in many ways. Many of our internal processes were changed as a direct result of this initiative (for example, short sessions were originated in 1996 to accommodate the Accelerated Certificate Program) and this experience helped solidify ACC's commitment to being a part of workforce and economic development for our***

region… Different personnel had differing viewpoints on the appropriate degree of industry guidance. We had never been engaged with industry at the level we were for this initiative, so our personnel had to learn how to work directly with industry personnel to create curriculum that met the industry partners' needs, while still fulfilling our broader educational mandates. We also had many inflexible internal processes that were designed for a stable and very standard academic environment, and that required redoing to cope with a flexible and fast-moving partnership like this. We also just had the basic problems inherent in taking a program from 0 to 500 students in a couple of years. That, in and of itself, put a tremendous strain on our infrastructure and ability to manage."

So how was the program born? Industry approached the college for help; they asked the college if they wanted to be a partner, and the college said "yes." The following diagram displays an overview of the sequence of events that took place.

Historical Partnership Development Diagram



First, the economy got strong, then the demand for products that use semiconductors followed. Businesses expanded to react to the higher product demand, which led to the need for more employees. In the case of the local semiconductor industry, highly skilled employees were needed. Businesses started to struggle because they could not find enough qualified employees. Then businesses met and concluded that they wanted to partner with the local community college. They approached Austin Community College with the opportunity and the college responded very positively. Representatives from different organizations then joined the initiative. For example, state officials from the Texas Workforce Commission helped by awarding state funds for the creation of the SMT program (i.e. Skills Development Fund Program). After a series of meetings, strategies and goals were written and the program was then born. The following section details information about the partners, the partnership arrangements, and the benefits that were derived.

The Partnerships that Developed and the Benefits That Were Attained

The following is an outline showing the partnerships within a topic category and any corresponding subsets of each category. Following the outline is the information that was researched for each category.

SMT Partnership Topic Outline

1. Partnerships with Business/Industry
2. Partnerships with the Students and the General Public
3. Partnerships with Governmental Entities
4. Partnerships with Community Organizations
5. Partnerships Internal to the Institution
6. Partnerships with Universities and Colleges
7. Partnerships with K-12 Education Institutions
8. Partnership from within the Administration of the College

The following are summaries of the different partnerships developed by the SMT program:

Partnerships with Business/Industry

Partnerships with Large Companies

ACC has partnered with industry. The SMT department has partnered with Advanced Micro Devices (AMD), Motorola, SEMATECH, SEMI, Eaton Corporation, Applied Materials, Tokyo Electron, Samsung Semiconductor, Cypress Semiconductor, Crystal Semiconductor, Unit Instruments, Ebara Pumps, Leybold Pumps, Varian, Intel, and many other smaller companies. AMD has donated hundreds of thousands of dollars to the department in scholarship funds and equipment donations since the program's inception. When the SMT program was started in 1995, most of the large companies donated money, expertise, and equipment for the department. For example, AMD

donated $362,000 in cash for the start-up of the program (Midgley, ACC Dean; interview, April 2002). If the total donations from 1995 to 2002 are added and the "real" values of the equipment donations are used, AMD donations would easily be more than one million dollars. AMD has helped the program by supplying consultants and many adjunct instructors to the program. In addition, AMD hires many of the program's students and instructors as summer interns, and its graduates as permanent employees. In return, ACC's SMT department listens and acts on AMD's recommendations. Further, ACC supplies many much-needed and high-skilled employees to AMD, and whenever possible promotes AMD as an exemplary partner. Motorola, like AMD, regularly donates scholarship money, provides employees flexible scheduling arrangements so that they can work as adjunct faculty for the program, hires many of the graduates, and has donated many expensive machines that are used as critical training tools in the program. The usage of such "real" equipment for training of the students has catapulted the department to one of the best in the country, as is evidenced by the unusually high number of visits to the program by community college representatives from all across the United States and other countries. These visitors typically have stated that they were visiting the SMT program because of its reputation as being one of the best ones in the country, maybe the best one, at the community college level. Further, the program has recently completed its cleanroom facility with the financial and engineering assistance of the local semiconductor industry. Further, Motorola managers and engineers have volunteered to provide presentations to the program's students on a regular basis and to

be judges and provide feedback to student presentations required in second-year courses. The Motorola volunteers include personnel from engineering and human resources.

It was one of SEMATECH's senior executives who first promoted the idea of developing a more comprehensive semiconductor educational infrastructure in Central Texas, namely, the development of ACC's SMT program. His name was Frank Squires. Frank Squires recently died and hence ACC appropriately named the building on which the semiconductor program is housed, The Frank Squires Building. SEMATECH itself is composed of partnerships with semiconductor companies and whose goal is to advance technologies used in this industry and to provide some insurance that some American companies continue to dominate a large part of the world's semiconductor industry, which is one of the most lucrative—yielding many high-paying jobs that induce tremendous economic development wherever they are located. SEMATECH has been a partner of ACC since its inception; it has donated many tools, scholarship funds, and has always donated the time of in-house experts to assist with SMT technical issues. Applied Materials, the world's largest maker of semiconductor equipment, is also a key partner. They also have donated equipment and money and have, with open-arms, allowed SMT professors and their students to visit their facilities and hold training using their multi-million dollar tools (Applied Materials University Facility in Austin, Texas). In November of 2001, Applied Materials donated the SMT program's most advanced tool, the Precision 5000 Cluster tool; this is the same tool housed at the Smithsonian Institute in Washington D.C. for allowing revolutionary progress in building microchips. The tool would sell for about $1.5 million dollars if new, and a copy of it is also used for training

students at Penn State University and the University of Seoul, Korea. For being a community college program, the recent acquisition and usage of the tool for student training has further solidified the ACC SMT program as one of the best in the country. In addition, Applied Materials was so impressed with ACC's facilities and equipment, that they decided to hold one of their two-week 8300 (type of semiconductor machine) customer training classes at ACC's facility. The customers were flown in from Singapore and the class turned out to be a success. It was an honor for ACC to have hosted such a class because Applied Materials is known for demanding perfection in all its endeavors within the semiconductor industry. Applied Materials, like previous companies mentioned, also hires many of the graduates. Samsung, one of the most respected companies to work for in Korea—if not the most respected, decided to place their first semiconductor facility (fab) outside of Korea. They chose Austin, Texas. One of the reasons was the availability of a trained workforce and of the educational infrastructure in place for its future needs. Samsung has also been very willing to provide monetary donations for scholarships and equipment and hires many of the graduates. Tokyo Electron, a major semiconductor equipment maker in the world headquartered in Japan and with facilities in Austin, has also been a very valuable partner for ACC. When Tokyo Electron first arrived in Austin in 1997, they immediately gave ACC's SMT program $29,500 for student scholarships. Then they went on to hire a very large percentage of the graduating students in order to assist them in building their human resource infrastructure in Austin. Cypress Semiconductor and Crystal Semiconductor, though smaller companies than Motorola and AMD (in Central Texas) have also been

highly valued partners in that they have hired many of the graduates of the program. Their willingness to work closely with ACC is apparent as the Site Managing Director of Cypress Semiconductor told one of the SMT Professors, "whatever we can do to help you, just call me." The hundreds of thousands of dollars of equipment and scholarship donations that ACC's SMT program has received from various companies is proof that such words are not hollow. The following two tables display the industry donations that were given to the SMT program between 1995 (when the program was created) and April of 2002. The first table shows donations in cash and the second table shows donations categorized as in-kind (for example, equipment). These amounts only include industry donations and do not account for grants such as $400,000 from the Skills Development Fund Program via the Texas Workforce Commission. The tables are shown in the following two pages.

Industry Cash Donations to SMT Department, 1995-April 2002

Donor	Amount
AMD Scholarships	$118,666.26
Applied Materials Scholarships	$25,000.00
Cypress Semiconductor Scholarships	$6,000.00
Eaton Corporation Scholarships	$10,000.00
Robert W. Galvin Endowment	$104,708.62
Motorola Scholarships	$45,000.00
Sematech Scholarships	$30,000.00
SEMI Scholarships	$93,100.00
Tokyo Electron Scholarships	$29,500.00
Sub Total	$461,974.88
Additional Contributions	
Squires Faculty Fellowships - Corporate and Individual Donors	$50,174.93
Semiconductor Industry Association - SMT Marketing/Recruitment	$18,000.00
SMT Support from AMD	$312,000.00
Sub Total	$380,174.93

(Industry Only) **Cash Total** **$842,149.81**

Source: Stephanie Diina, ACC Executive Director of Foundation Resources, April 2002.

Industry In-Kind Gifts to SMT Department, 1995-April 2002

Donation Date	Company	Short Description	Inventory #	Value
01-Jul-96	SEMATECH	twenty-four 386 computers, monitors and keyboards ($600 ea)	26190-26213	$14,400.00
27-Aug-96	SEMATECH	Silicon Run I & II video tapes	n/a	$600.00
01-Nov-96	SEMATECH	Polyvar microscope w/robotic arm & table	26473	$60,000.00
20-Nov-96	TEXWIPE	cleanroom supplies & samples and training video	n/a	$0.00
31-Oct-97	SEMATECH	Semiconductor equipment - Gaertner Ellipsometer, MTI Track System, and FSI Excaliber	#28256,#28355, MTI Track Sys(see file)	$30,300.00
18-Jun-98	Samsung Austin Semiconductor	cleanroom supplies: gloves, shoe covers, hoods, goggles, smocks, masks, and shoe covers	n/a	$3,300.00
18-Sep-98	FINLE Technologies, Inc.	Software	29239	$30,500.00
01-Oct-98	SEMATECH	semiconductor equipment	n/a	$74,000.00
27-Jan-99	SEMATECH	electronic equipment	n/a	$0.00
01-Mar-99	AMD	semiconductor equipment - several items	31177-31186, 31188-31194	$63,100.00
12-Apr-99	Motorola	SMT Equipment	31122-31138	$177,659.00
27-Apr-99	AMD	34 books - Integrated Circuits, Making the Miracle Chip	n/a	$340.00
30-Apr-99	SEMATECH	semiconductor equipment	n/a	$10,000.00
01-Aug-99	AMD	SMT items/parts	n/a	$250.00
16-Jun-00	AMD	excess fab 25 hook-up and facilities installations material	n/a (myriad of small parts)	$138,466.73
21-Mar-01	Motorola	Shelving, benches, racks and tables	n/a	$1,500.00
01-Apr-01	IBM	Microscope	n/a	$0.00

11-Apr-01	Motorola	Microcontroller chips	n/a	$6,492.54
01-May-01	Motorola	Ellipsometer	32429	$9,000.00
06-Jun-01	Motorola Drosett Warehouse	various 8330 spare parts (pedestals, gas tubes, pipes, lexan process kits)	n/a	$15,000.00
19-Jun-01	Austin Integrated Systems	valves, cylinders, sensor, fittings	n/a	$27,150.18
10-Aug-01	Austin Integrated Systems	pneumatic cylinders, valves	n/a	$35,679.37
27-Aug-01	N/a - individual	electronic parts and equipment, testers, transformers, 3 tool boxes	n/a	$310.00
14-Dec-01	Applied Materials	P5000 System	5K10025	$300,000.00
05-Feb-02	N/a - individual	semiconductor wafers and cassettes	need - sent to warehouse 2/14/02	$1,300.00
23-Apr-02	AMD	SLC500 PLC System	need	$20,000.00
				$1,019,347.82

$ 1,019,347.82

$ 1,861,497.63

Source: Stephanie Diina, ACC Executive Director of Foundation Resources, April 2002.

Partnerships with Small Companies

ACC's SMT department has also partnered with smaller semiconductor-related companies. These relationships have turned out to be mutually-beneficial to both parties. An example is EBARA Pumps, a Japanese company with a manufacturing and sales site in Austin, whose products are vacuum pumps—devices needed in almost every piece of semiconductor equipment. AMD donated several manufacturing tools to the SMT

department, but they specifically stated that the pumps were damaged and needed to be rebuilt, a cost that would be about $14,000. ACC's SMT program partnered with EBARA, the maker of the pumps, by making a trade that would be very beneficial to both. The SMT department would train most of their employees on many semiconductor areas that were outside of their main expertise area but that were critical to their understanding of the larger picture so that they would, in essence, be able to serve their customers better. In return, they completely rebuilt and cleaned the SMT pumps that had been originally donated by AMD. EBARA employees were extremely impressed and thankful for the training (as was evidenced by their class evaluations and their manager feedback to the SMT program) and ACC students were likewise, as they got to use the actual pumps in a safe environment. This partnership will only get stronger as EBARA managers have expressed their deep desire for not only continuing this partnership but in enhancing it. Unit Instruments, a company with a manufacturing site in Round Rock, Texas, makes Mass Flow Controllers (MFCs), a product used in virtually every semiconductor tool in the world. They have also partnered diligently with ACC's SMT program. They have donated about $100,000 worth of MFCs to the department so that the students can incorporate them to their school projects and have regularly held special classes at their facilities for SMT visiting student classes. The SMT/Unit partnership is on its fifth year. Automated Dynamics and Swagelock are two smaller companies that are also suppliers to the semiconductor industry. They sell components used everywhere in the tools and in the manufacturing facilities. They have both provided regular guest presenters to SMT classes and have also donated many smaller components for student

projects. Their philosophy has been that the more educated and familiar students are with their products, the more likely it is that those students will purchase their products once they hold decision-making authority in the industry. Leybold Pumps, a German pump company, also donated critical training demos to the SMT department; the demos are used every semester for training purposes.

Partnerships with Industry via an Industry Advisory Council

SMT department personnel have asked the same questions that futurists in the community college world have been asking such as: how and which customers will they serve in the future? Through which delivery systems will those students be reached in the future? What programs and services will make the program unique? And what will be the basis for their competitive advantage tomorrow (Alfred, 1996)? ACC has opted to answer these vital questions with others—partners. ACC's SMT department has an industry advisory council who meets regularly (at least twice a year). Representatives from the larger companies are represented in the advisory board, as well as professors and administrative staff connected with the SMT program. One purpose of the committee is to plan, evaluate, and revise curriculum and effect any other changes that enhance the department to assure that students are taught both what industry deems most valuable and appropriate today and tomorrow, in conjunction with what professors deem is also in the interest of the students and the community. The SMT professors and some ACC administrators also voice the students' views by constantly performing written and

oral surveys of their students and disseminating that information at the meetings. Such an inclusive arrangement allows for some form of balance between what industry wants and what professors perceive to be of benefit to the students. The SMT department is currently discussing whether having students directly involved in the committee would enhance decision-making. The committee has been very helpful since the program's inception in developing and modifying its curriculum, designing the building, acquiring scholarship funds, providing many internships, and assisting in hiring almost all of the graduates. Through money donated by industry, the program was able to offer 50 scholarships every year through 2002 (Almanza, ACC SMT Student Advisor; interview, March 2002). During the 2002-2004 semiconductor industry economic downturn, scholarships available dropped, but only to about 30 scholarships (still a healthy number). For the students that already work for the industry, the companies pay all their expenses through their internal school tuition reimbursement programs.

The recent economic and industry downfall also affected student-job placements starting in the Fall 2001 to the present (student job placements were in the upper 95 percent from 1995 to 2001). Further, the industry advisory board and personnel from the department and ACC are reassessing the future of the semiconductor industry in Central Texas and reviewing the options for the program. Discussions have been on-going about diversifying the program into broader areas including automation, general manufacturing, MEMS (micro electromechanical systems), and in providing different degree options with different transfer potentials to four-year university programs.

Partnerships with the Students and the General Public

This is an area that the SMT program needs to work on much more. It is a challenging area where the SMT department needs to assess and strategize for successful partnerships. The program is involved in many partnerships that benefit the student and the community, but formal mechanisms to involve the student and community members in various decision-making capacities are yet to be developed and instituted.

Partnerships with Governmental Entities

Another critical partnership that is never ignored is between ACC and the State of Texas. When ACC developed the first blueprint for a semiconductor technology program with the local semiconductor industry in 1995, the institute partnered with the state to acquire additional funding. It was through various agencies of the state government, the Texas Workforce Commission (TWC) and the Texas Department of Commerce (TDC), that ACC's SMT program has received large grants via agreements. The TWC awarded ACC approximately $484,000, of which $400,000 was to be used for the semiconductor program (Midgley, currently ACC Associate Vice-President of Workforce; interview, April 2002). The award was given through the Skills Development Fund Program (SDF). In return as part of the contract, ACC made the commitment to graduate a certain number of students within a given time frame. The contract was satisfied by both partners and the college program continues to graduate students every semester. The TDC channeled money to the program through a different route. They partnered with industry by giving

money to companies for training their employees and then the employers turned around and contracted ACC to provide much of the training (the SMART Jobs Program). Either way, partnerships were made and everybody benefited tremendously.

Partnerships with Community Organizations

Other partnerships that have been essential to the program include partnerships with community organizations, whose purposes are for helping unemployed or underemployed people go to college and simultaneously to assist in raising the economic strength of Central Texas. Much literature is available calling for more connections between the community college and their communities (Augustine, 1998; Swerling, 1998; Roueche, 1995; Cantor, 1995; Kramer, 1983; Gurian, 1995; and Wenrich, 1994).

Jon Travis, Assistant Professor and Director of the Center for Community College Education at East Texas State University, provided insight into the importance of these organizations to society. He stated: "…social problems are devastating our society, particularly in urban areas" (Travis, 1995). Raul Anorve called for educational institutions to provide solutions to people who are poor or disadvantaged as he stated, "we all need to remember: illiteracy is not a choice. No one chooses to live in a poverty-stricken area earning minimum wages for ten, fifteen, or twenty years" (Anorve, 1989). An organization that focuses on such issues includes the Capital Area Training Foundation (a branch of the Austin Greater Chamber of Commerce), whose job it is to bridge the educational infrastructure (i.e. K-12, ACC, and local universities) to the

business community. They, in essence, act as facilitators between industry and these organizations. They systematically and formally acquire funds from industry and apply them to programs that benefit students and ultimately the industry that hires them. The Capital Area Training Foundation (CATF) works with the Semiconductor Executive Council (SEC), composed of top-level executives from the larger semiconductor firms in Central Texas. The members of the Executive Council strategize on finding the best ways to economically enhance Central Texas and on how best to meet their companies' human resource needs. As part of this partnership arrangement, they (the companies) each pay a corporate membership fee and allocate substantial sums of money to support the various endeavors on which they agree. ACC's SMT department has been a large beneficiary of this arrangement; in 2000-2001, it was decided by the SEC, the SMT program Industry Advisory Board, and by SMT/ACC personnel that the building of a cleanroom was needed to enhance the learning process of the students. The SEC donated part of the costs, approximately $150,000 (Midgley, currently ACC Associate Vice-President of Workforce; interview, April 2002) and Austin Community college matched that amount. The cleanroom was completed in February 2002 and is now being used by the students in the program. The Capital Area Training Foundation has channeled thousands of dollars in donations from industry to the SMT program. They have been essential to the SMT program not only because they have acquired needed capital for the program, but also because they have consistently promoted the program at many area high schools and community groups as an excellent career development program. Another such organization is Capital IDEA. Capital IDEA is an organization that helps

unemployed or underemployed people go to college and study something that will most likely provide them with a job that will pay relatively well. Capital IDEA is funded in part by Travis County and the City of Austin. The organization pays for all tuition, books and supplies, bus passes to get to and from school (if transportation is needed) and day care for students who apply, are in financial need, and are willing to go into areas that pay at least $10 per hour (for example, the semiconductor industry). Their goal is to help people get training and in so doing strengthen the community economically, and ultimately the standard of living of its population (Baker, Capital Idea Career Counselor; interview, February 2002). They promote areas such as high tech, health care, financial services, technical services, and for people who want to take the GED. ACC formed partnerships with other organizations such as ENLACE, who also acquires funds from different sources (primarily from the Kellogg Foundation) to then distribute to needy students who want to go to college. The ACC SMT program at the Riverside Campus (located in East Austin, an economically disadvantaged area of Austin) has even partnered with a local hamburger restaurant, Alonso's Tacos, that is highly frequented by high school students, whose high schools are located in some Eastern parts of Austin (Johnston, Travis, and Del Valle High Schools, mainly). The SMT department, in conjunction with ACC's outreach program, has held several lunch information sessions at Alonzo's Tacos. The high schools bus the students to Alonzo's Tacos for two to three hours, the SMT professors and staff describe the program and the industry, ACC's financial aid office personnel help students by providing the application, deadline timelines, and other relevant financial aid information, ACC's admission office personnel

help students with the admissions application, and ACC's outreach program personnel plan out and execute a follow-up strategy to insure that candidates who become interested in the program, are afterwards assisted and do enroll. Alonzo's provides the space and good atmosphere and ACC picks up the tab—the Alonzo's two-dollar lunch special! ACC has also developed an internal program through its Student Services department that also pays for day care for students in financial need. The program is paid through state grants that the college has acquired. All in all, partnerships of this type help students, industry, and the community. They make it possible for a person with children and a low-paying job to, not only survive, but also to prosper. It is partnerships like these that attempt to allow all members of society, including the poor and disadvantaged, a more just and equal quality of life. In essence, they yield realistic hope.

Partnerships Internal to the Institution

Partnership from within the Administration of the College

> *It seems elementary to say that nothing gets done without a commitment from the administrative leadership in organizations. For without both commitment and leadership from upper level management, there can be no sustaining effects (Friedstein, 1995).*

Former college President Bill Segura was the one who held many initial meetings with various industry representatives. He had meetings with Frank Squires (former Vice

President of SEMATECH), Gary Heerson (Vice President of AMD), and many other executives to develop the semiconductor workforce development program at Austin Community College. President Segura was very effective in developing and creating the program. Once the program was well established, he left the college and was followed by Richard Fonte.

Former college President Richard Fonte made a personal commitment to ACC's SMT program's success at every opportunity he had. Dr. Fonte promoted the program to many segments of the community. The business community privately and publicly gave President Fonte much praise for his commitment to both the program and for implementing successful workforce development initiatives to help meet the business and local community's needs. President Fonte repeatedly was acknowledged by the *Austin American Statesman* and the local television media for his part in nurturing very strong partnerships with industry. Programs attributed to this success include the SMT program, as well as other programs in the college, such as the highly successful nursing and computer science programs. The Austin American Statesman is quoted as saying: "he (President Fonte) has proved an able steward of an asset vital to Central Texas. His workforce initiatives have added educated and talented employees to a booming community desperate for them…Fonte turned the school around, built an impressive relationship with Austin's business community and jump-started the important semiconductor and health-care initiatives that are so highly valued in this dynamic economy" (Austin American Statesman, Jan. 5, 2001). President Fonte was also featured in the *McNeil-Lehrer Report*, a national television news program, for the success of the

SMT program and for the strong and growing partnerships between the college and the business community. High support and devotion to developing and maintaining strong partnerships with industry have also originated from many other college employees such as the former dean (currently Vice-President of Workforce) and virtually all of the faculty and staff of the semiconductor program and other similar workforce programs. The faculty, both full-time and adjunct, as well as the staff, cannot be ignored for their constant fervor in developing and maintaining partnerships with various groups. The faculty and staff are involved in multiple partnership agreements; they are involved in developing partnerships as well as in maintaining and enhancing them. The support provided from top administrators in insuring that current partnerships are maintained and nurtured and that new ones be created is highly appreciated by the faculty and staff and further encourages them to continue on those endeavors. The people within the college who are involved in making partnerships work includes many, but the leadership and support from the very top of the institution is a key and irreplaceable ingredient for success.

Partnership from within Departments

Another partnership that is largely ignored by many educational institutions is that of different departments within a school. It is all too common to see that faculty from one department know nobody from the department 'next door' and much less what they do. Barbara Leigh Smith and Rosetta Hunter, both administrators at Evergreen State

College and Seattle Central Community College respectively, both in Washington State, have been criticizing these lost opportunities since the 1980's. They stated:

"despite the fact that many faculty members are broadly trained and strive to present diverse perspectives, in the traditional classroom there is ultimately only one faculty member, one disciplinary perspective, one methodology. In most institutions faculty members seldom interact with each other; when they do, it is almost invariably outside the classroom. Teaching is often a lonely and redundant experience; it seldom encourages faculty development or the transfer of knowledge between faculty" (Leigh Smith, 1987).

Many others in the literature voice similar concerns and provide success stories (Bumphus in Roueche, 1997; Roueche and Roueche, 1993). At ACC's SMT program, some faculty have partnered with a faculty member from the computer science department and another faculty member from the welding department. The reason—they all benefit by providing a richer educational experience to their students and to themselves. In the capstone course (the last course required for graduation), an SMT faculty member co-teaches with a computer science faculty member. The SMT faculty member teachs about the machines and the hardware and the computer science faculty member teaches about the software that makes the hardware and machines work. The students thoroughly enjoy this relationship because they learn from two experts in their respective areas, areas needed to complete projects that require strong expertise in both disciplines. In addition, these instructors co-facilitate summer science programs, academies for various community youth. Likewise, the welding department teaches

'orbital welding,' specialized welding for the semiconductor industry, but their students never get to see what happens at the other end of their work. SMT students learn what happens at 'the other end' but not what happens at the facility end (welding end) and so instructors take their students to each other's classes so that they receive a more 'comprehensive' education. Again, students appreciate and enjoy these partnerships thoroughly.

Likewise, other internal partnerships exist between the SMT department and other ACC departments that assist the SMT departments in various functions. For example, the SMT department works with ACC's outreach department to reach out to the community, with the international programs to do international student exchanges, with the grants office to apply for various grants, and with the donations office to request and accept industry donations.

Partnerships with Universities and Colleges

Partnerships with four-year Educational Institutions

The SMT department has articulation agreements with Southwest Texas State University (SWT), St. Edwards University, Texas A&M University, and with all the community college semiconductor programs in Texas via a state-mandated articulation agreement. Even though articulation agreements already exist, the SMT department is currently in the process of 'partnering even more' for the benefit of the student. The

SMT department is having meetings with Texas A&M Kingsville to create more student-friendly articulations whereby most of the courses transfer to Bachelor of Applied Science Degrees in Technology and to see if the university can offer the junior and senior technical courses at the ACC Frank Squires Building so that graduating SMT students can simply continue on for the bachelor's degree. ACC is also looking to develop an articulation agreement with Texas A&M College Station's Industrial Distribution Program, Manufacturing Engineering, and Semiconductor Program. ACC is also connected to many other community college semiconductor programs throughout the country through the Maricopa Advanced Technology Education Center (MATEC). MATEC is a national organization for semiconductor programs at the community college level that is funded by the National Science Foundation for the purpose of developing standard curriculum for the many semiconductor programs throughout the country. Dr. Fonte was a very strong supporter of the program and was a very active and supportive board member of MATEC.

Partnerships with K-12 Educational Institutions

Partnerships with other educational institutions are also essential to the SMT department's present and future successes. Alberto Lorenzo, President of Macomb Community College (Michigan) in 1991, stated: "Employers will expect us to prove to them that we have in the pipeline a sufficient future supply of labor to meet their needs. They will not be satisfied with just a two-year supply. They will want to see programs

that reach back to high schools and even grade schools to groom future talent" (Lorenzo, 1991). These partnerships with area high schools are also extending to four-year institutions.

The SMT program committed itself to developing better relationships with high school teachers and students via the Tech Prep Program. The Tech Prep Program facilitates the process for creating and sustaining articulation agreements with various high schools. Through Tech Prep agreements, some high school Electronics courses transfer directly to the college and therefore offer students a head start once enrolled in the program. Further, the Tech Prep Program serves as another marketing tool for informing students about careers in the semiconductor industry. In addition, the SMT department in December of 2001 started visitations to high schools on various days of the week, typically Wednesdays. At every visitation, the program's student advisor and at least one full-time faculty member would be present to talk with students about the semiconductor industry, scholarships, and the requirements to get accepted. The department chair attended more than half of all the visitations to insure proper support and leadership for these endeavors. These visitation activities have expanded over the years. In the summer of 2004, the month of June brought many middle school kids for summer camp to the Frank Squires Building; likewise the month of June brought many high school juniors and seniors to a summer camp; and finally the second week of June brought about 20 high school teachers to the building for automation and robotics training. The purpose of these camps is to add value to the community by providing training and knowledge about high technology to kids who may some day be the leaders

of high technology in our communities and to the teachers who have much influence over this kids. The students really enjoy these experiences and some teachers have stated that this camp has been the highlight of their summers; they leave very appreciative and become long-term friends and partners.

Partnerships with International Educational Institutions

ACC's SMT program has also partnered with schools abroad. ACC former Director for International Education, Dr. Frank Schorn, had been the main force behind making ACC one of the first colleges in the country to be awarded a Fund for the Improvement of Postsecondary Education (FIPSE) grant. The FIPSE grant essentially promotes student and faculty exchanges between countries and pays for transportation and housing costs. ACC's SMT program has established formal relationships with schools in the Netherlands, Germany, Mexico, and Canada, and it has already sent three students for one semester to the Netherlands, three students to Canada, and three students to Mexico. The SMT department has also hosted students from Mexico on numerous occasions. Three students from Mexico were hosted in the summer of 2003 and three more students in the summer of 2004. A faculty exchange with Australia has also already occurred; a faculty member from Australia spent three months at the SMT program. The purpose of these interchanges is to provide students the opportunity to experience a different culture, while simultaneously working at a company located in the host country and/or attending school there. The need for 'internationalizing' curriculum is well supported by the

following comment, "Not only will there be greater emphasis on learning about self, but there will also be more attention on learning about others. In some ways, despite our role on the international scene, we in America have been spendidly isolated at times, and that has been translated into our own curriculum. However, those days are 'gone forever,' as the saying goes. The individual in America cannot be isolated from his or her society, and that society will not be isolated from developments in the world. There will be more global interaction, and the need to understand cultures other than our own will be obvious. Think about it a moment: for students 18 to 21 years of age, who may be in our classrooms this coming Fall, half of the nations on Earth did not exist in their present form when they were born!" (Hankins, 1997). An urgent call for such education was made by Robert DeHart, President of De Anza College in California: "How do we introduce cultural diversity and internationalism throughout our curriculum?" (DeHart, 1992). Dr. Schorn stated: "ACC is now in the forefront in providing students an opportunity to expand their education here with a different cultural experience abroad that includes coursework, a foreign internship, and an experience never to be forgotten…the SMT Program is one of our top marketing tools critical for the success of many of these partnerships" (Schorn, March 2, 2001). It is the experience of the SMT program that the main gains in international student exchanges has not been in the students going abroad, but in the students who have come for a semester from other countries. For example, the three students from Mexico who are here this summer 2004 semester have shared methods, processes, and ways of doing things that are different. The American students and the faculty have learned much from these students and have

stated in private that these students have lifted the bar and enhanced the learning process for all the students in the classroom. The international student exchanges have also brought higher marketing value and prestige to the SMT program and to ACC as a whole, for being innovative and a leader in the international education arena.

Chapter Conclusion

The purpose of this chapter was to report the partnerships that were developed and maintained, the partners who were involved, and the benefits that were attained from those partnerships. After doing the research, it became increasingly apparent that the college and the workforce program had developed a multitude of partnerships that directly benefited the students, the companies involved and the industry, the community college and its program, other organizations that partnered, like CATF, Capital Idea, and the Chamber of Commerce, and, ultimately, the whole region because of the economic development component that resulted. The school was able to use partnerships to finance and develop tangibles, such as the building, the electronic equipment and the semiconductor tool equipment (large machines), to pay for the cleanroom to teach the process courses, to develop and continuously update the curriculum, to hire and borrow faculty from the different companies, to acquire large funds for scholarships, to attain internships for students (additional hands-on training) and faculty (for faculty development), to place students in good jobs upon graduation, for marketing, and for a myriad of other functions.

Chapter Five

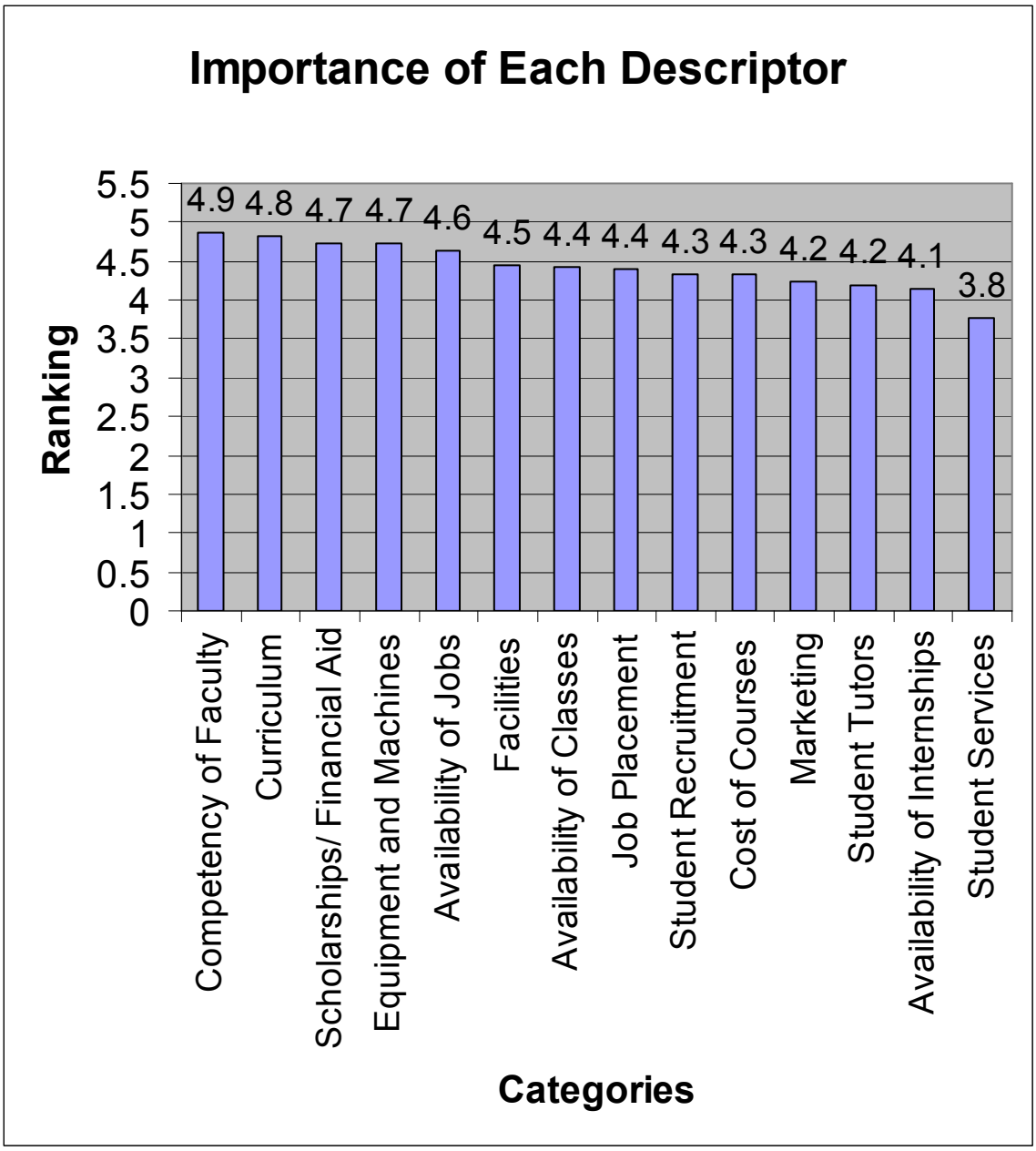
Study Results Part 2—The Relative Importance of the Success Factors (Elements) on a Community College Workforce Program and The Impact that Each Partner Group Effected on the Success Factors

The Relative Importance of the Success Factors (Elements) on a Community College Workforce Program

To determine the factors or elements that made the SMT workforce program a success, an initial set of factors were written and then expanded and tested for validity by sets of students, some faculty, some administrators, and some partner members representing different companies. From these initial interviews, a final set was developed. This final set of elements or parameters were the ones that were used for the assessment. The assessment was implemented by utilizing questionnaires and personal interviews. Two questionnaires were developed. Questionnaire A evaluated the program, rated the success elements to determine which ones were more important for any workforce program, and rated the effect each of the partners had on each element; this questionnaire was applied to all the participants. Questionnaire B was utilized to find the sequence of events that occurred to develop the partnerships, who was involved and when. This second questionnaire typically involved a personal interview after the first survey had been filled, to clarify the responses and to investigate if other relevant pieces of information had been hidden or simply not asked. Questionnaires A and B are located in Appendix A and Appendix B, respectfully.

Importance of Each Descriptor

Questionnaire A involved 23 participants and was distributed among industry partners, college administrators, students, faculty, and representatives of various community and governmental organizations. The questionnaire was very revealing in that it provided much information about the program and about the perceptions that each partner had about what actually happened. The first part of the questionnaire revealed what extent each of the selected elements (success factors) had in forming a successful workforce program; the results are shown in the following graph.

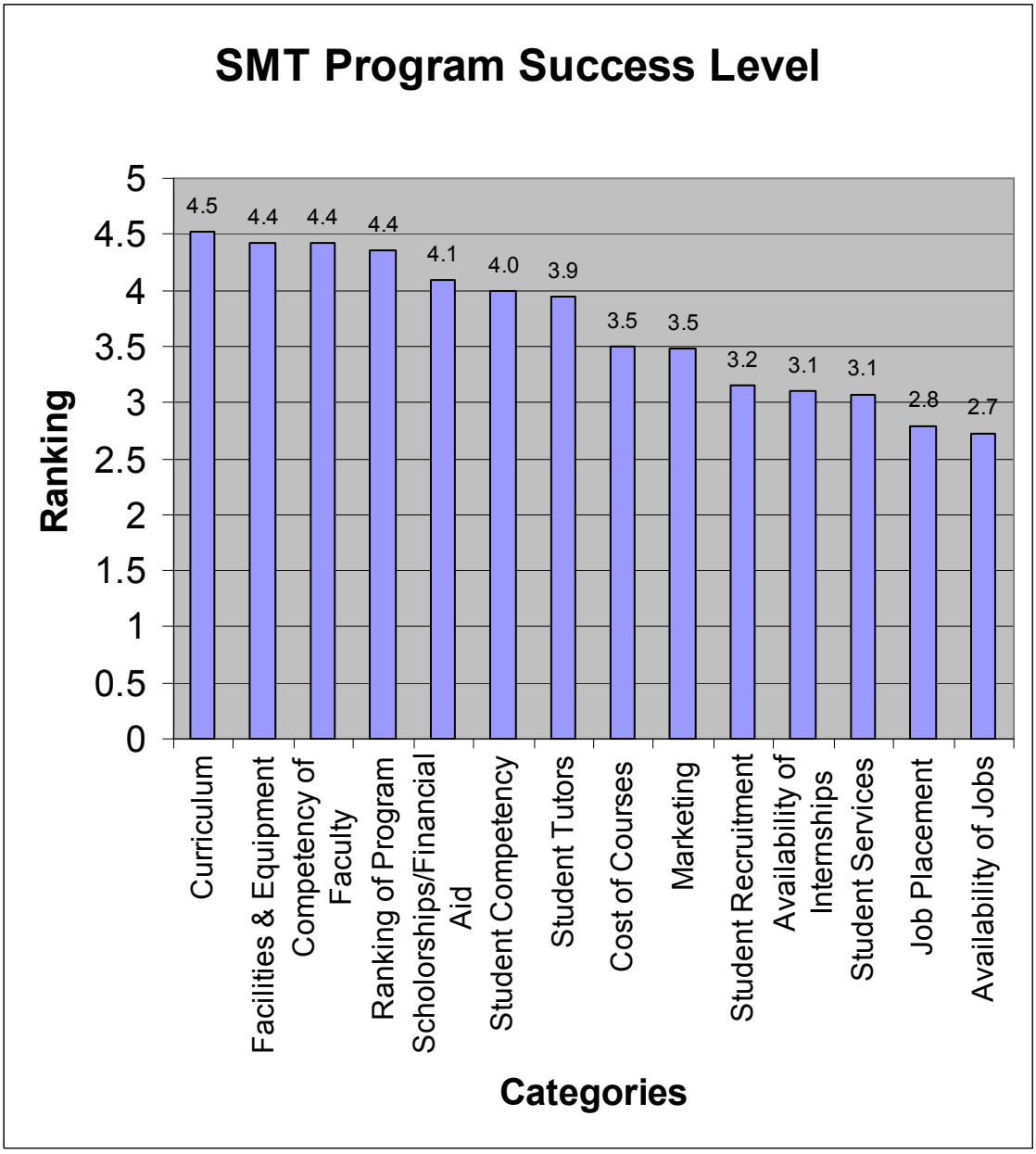


In the above graph, the scale was set from one to five, one being unimportant, two being of little importance, three being moderately important, four being important, and five being very important. Therefore, the graph shows that all of the elements were

considered between important and very important (the highest rating), with the exception of the student services category. This and all the following graphs were created in such a way that all the elements were listed from left to right corresponding to highest ratings to the left and lower ratings to the right; this was intentionally done to highlight the strengths and show the weaknesses or areas of less relevancy to the right (according to the survey results).

SMT Program Success Level

The next graph depicts how the participants rated the SMT program relative to those same elements.



In the previous graph, the Success Level of the SMT program is shown with a rating scale from one to five. One represents very poor, two below average, three average, four above average, and five exemplary. The graph shows that the program was

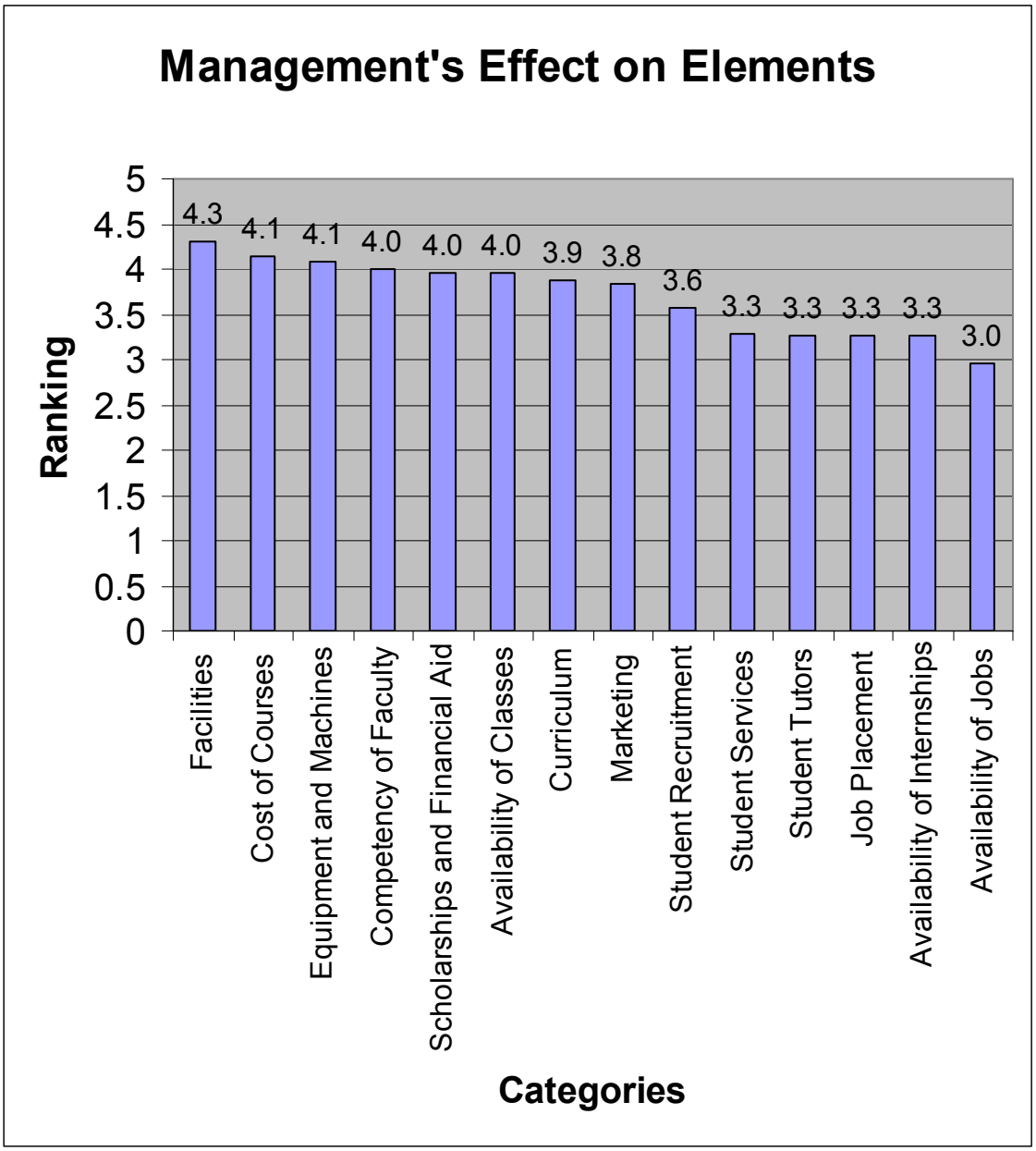
very highly rated for curriculum, facilities/equipment, competency of faculty, overall ranking of program, scholarships/financial aid, and student competency. However, the program's ratings were average or below average in areas such as job placement and availability of jobs. Job placement became a particularly difficult challenge in the years between 2001 and late 2003, the time period corresponding to the worst industry downturn that the semiconductor industry had ever experienced. However, by early 2004, the industry was showing signs of economic strength and likewise, job placement was improving.

The Impact that Each Partner Group Effected on the Success Factors

Questionnaire A yielded nine more graphs. Each of the following graphs shows what all the participants (representing the different groups) thought were the effects of the different groups on the different common elements (descriptors) already discussed. The individual questions in the numerical questionnaire were tabulated as an aggregate and were represented in the graphs in descending order from highest effect to lowest. The groups were: A) ACC Leadership and Management, B) ACC SMT Program Faculty and Staff, C) Semiconductor Industry Advisory Board, D) Semiconductor Executive Council, E) SMT Students, F) Capital Area Training Foundation, G) Capital Idea, H) National Economy, and I) Other factors. The graphs are shown in the same order as mentioned.

Management's Effect on Elements

Graph A represents the effect ACC leaders and administrators had on the elements or descriptors according to the participants in the study.

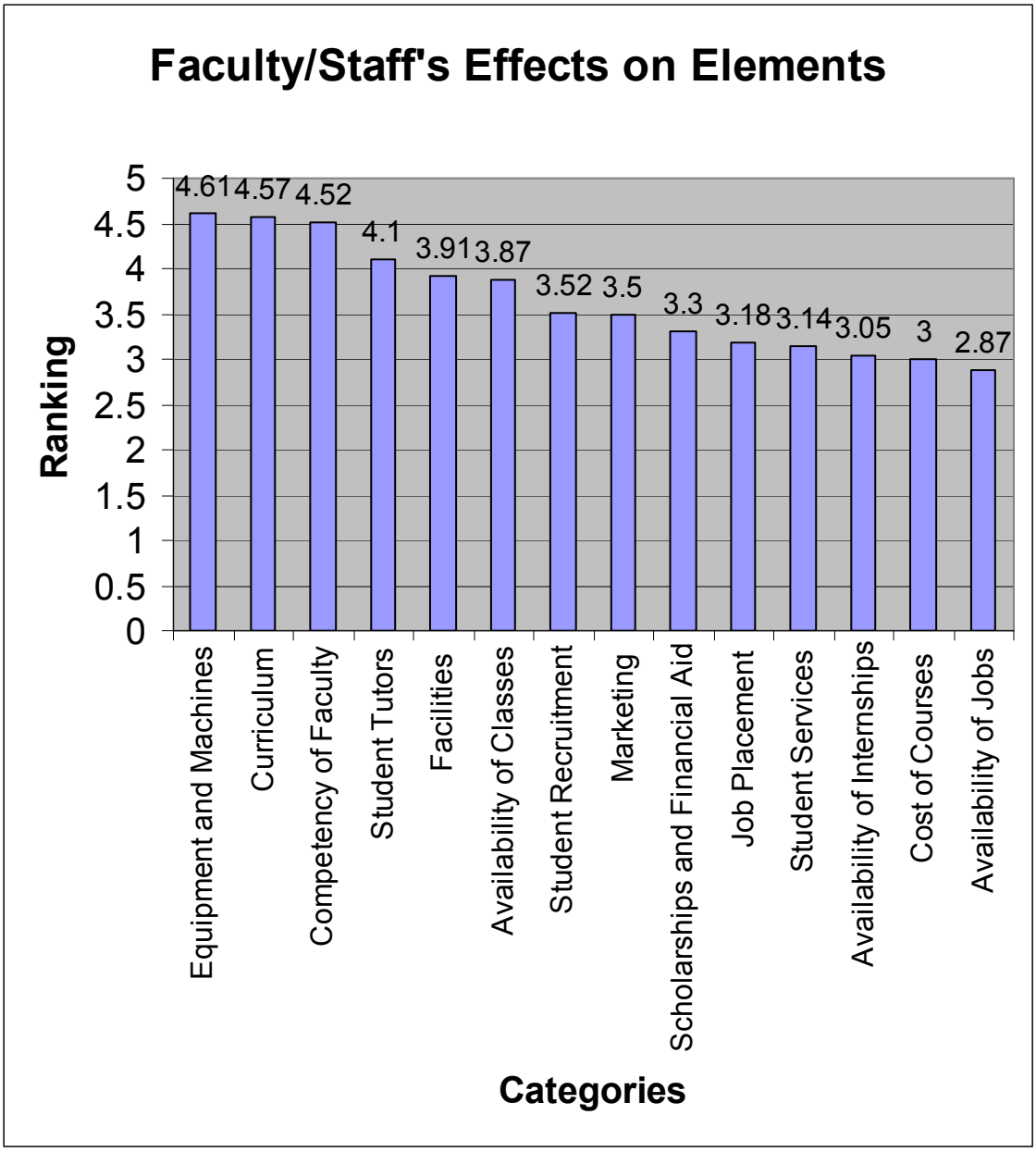


Graph A

As is evidenced in graph A, the participants thought that ACC administrators had a high effect on descriptors such as facilities, cost of courses, equipment/machines, competency of faculty, classes availability, and curriculum (areas considered of very high importance in developing a successful workforce program). Areas such as marketing, student recruitment and the availability of jobs and internships received lower marks; however, the ratings were still relatively high for the lower rated descriptors.

Faculty/Staff's Effect on Elements

Graph B focused on the effects that ACC SMT faculty and staff had on the same descriptors.



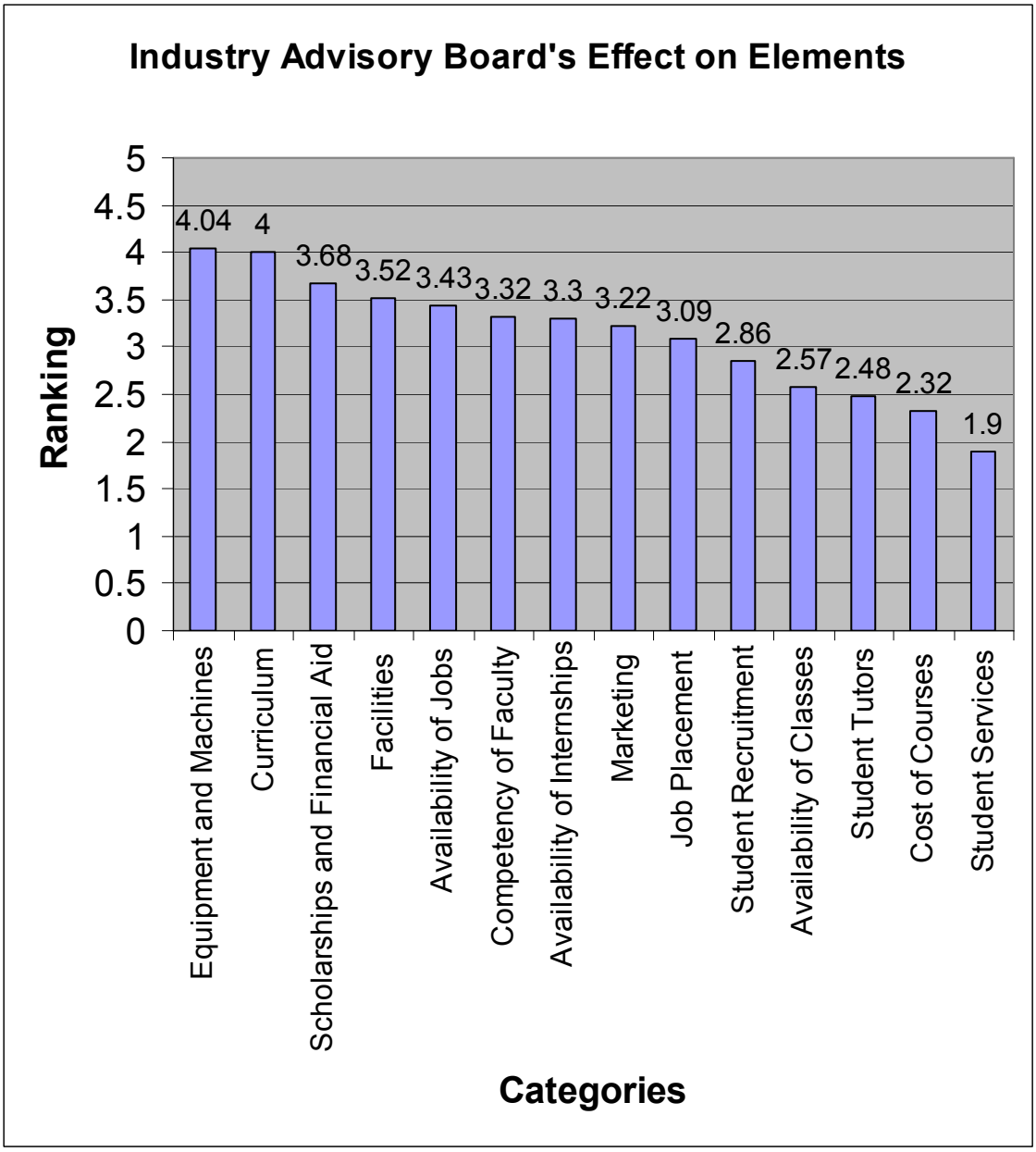
Graph B

The program's faculty and staff received some of the highest ratings. They received high ratings on descriptors such as equipment/machines, curriculum, competency of faculty, tutors, and facilities—areas considered of very high importance in

developing a successful workforce program. However, similar to ACC administration and management, they received lower marks in areas such as internship and job placement, as well as areas such as student services and cost of courses.

Industry Advisory Board's Effect on Elements

The following graph, Graph C, focused on the effect that the Semiconductor Industry Advisory Board had on the same descriptors.



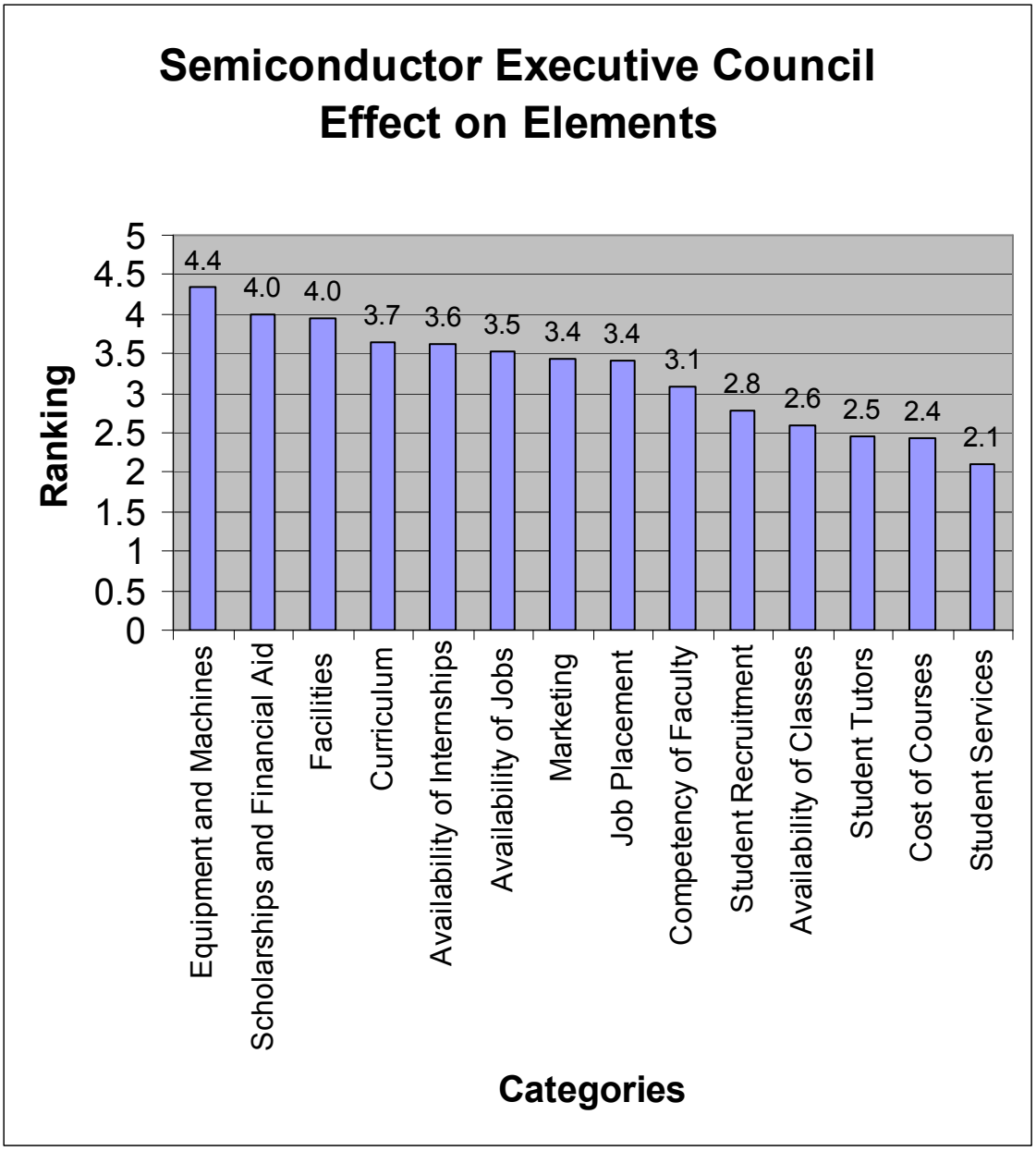
Graph C

Graph C displayed the effects of the Industry Advisory Council on the descriptors, according to the questionnaire. High marks were given to areas such as

equipment/machines and curriculum. Areas such as student recruitment, availability of jobs and internships, competency of faculty, and marketing did not receive high marks.

Semiconductor Executive Council Effects on Elements

The following graph, Graph D, focused on the effect that the Semiconductor Executive Council had on the same descriptors.



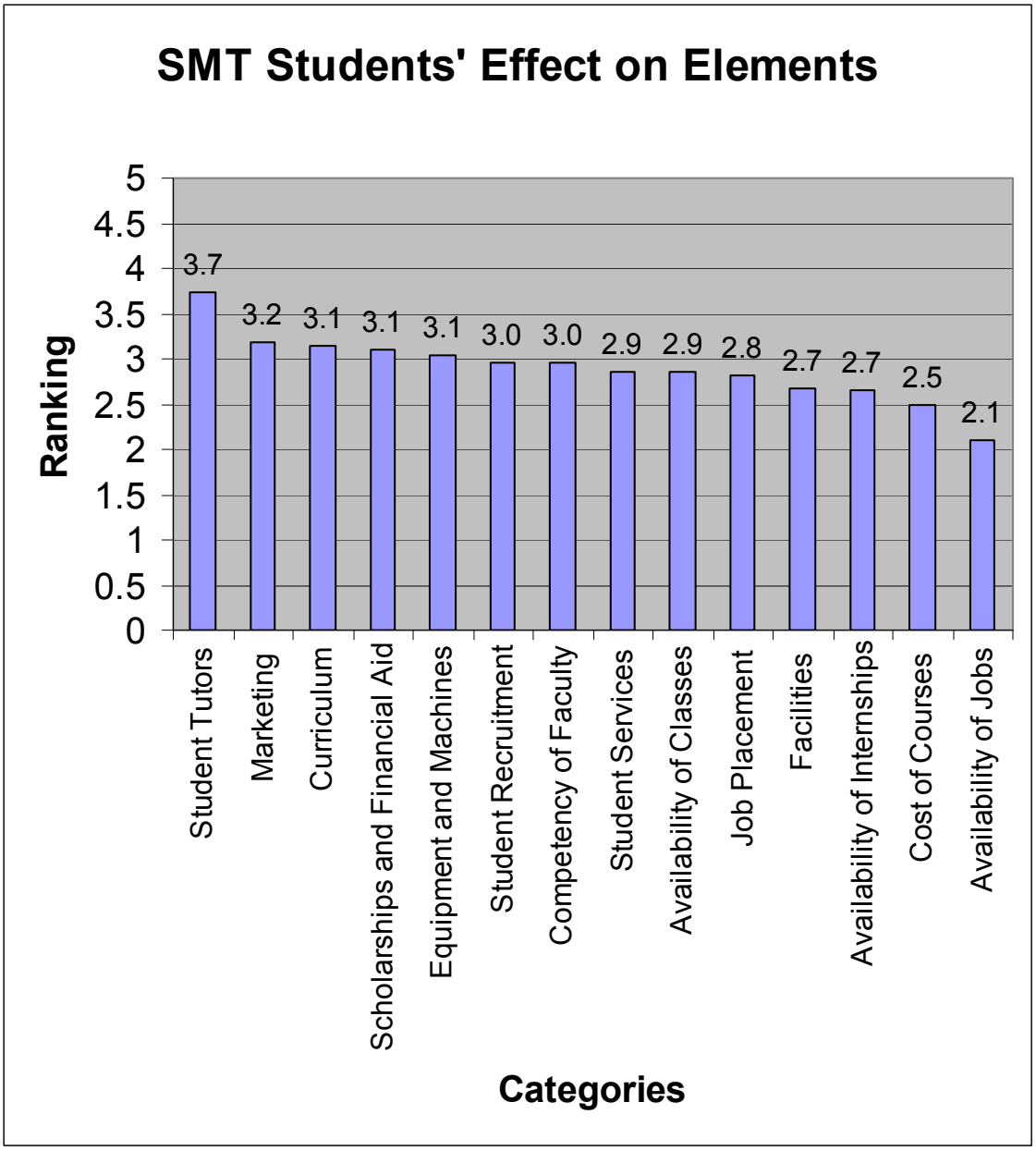
Graph D

Graph D displayed the effects of the Semiconductor Executive Council on the descriptors, according to the questionnaire. High marks were given to areas such as

equipment/machines, scholarships and financial aid, and facilities. However, areas such as marketing and student recruitment did not receive high marks.

SMT Students' Effect on Elements

The following graph, Graph E, focused on the effect that the SMT students had on the same descriptors.



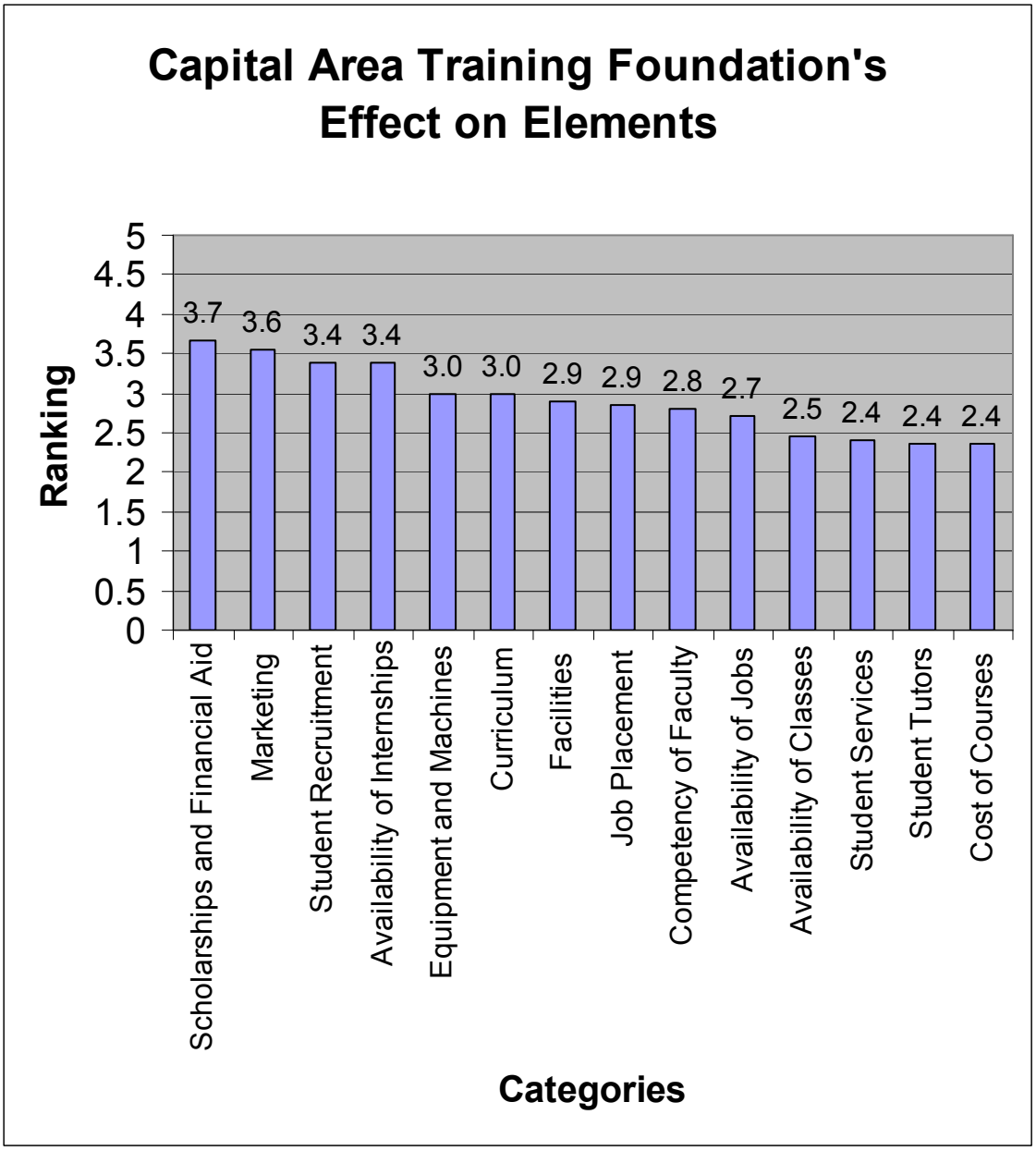
Graph E

Graph E showed that students exerted influence in areas such as student tutors, marketing, and curriculum. Students can have high effect on curriculum if students are

working on challenging projects that are always changing and adding on previous successes and failures. In this program, student projects were continuous and always additive from previous semester students and therefore always more advanced and productive for students. Students can be very influential promoters of a program if they see much value in the program. It was not uncommon to meet new students of the program who had been introduced to the program by previous students.

Capital Area Training Foundation's Effect on Elements

The following graph, Graph F, focused on the effect that the Capital Area Training Foundation had on the same descriptors.



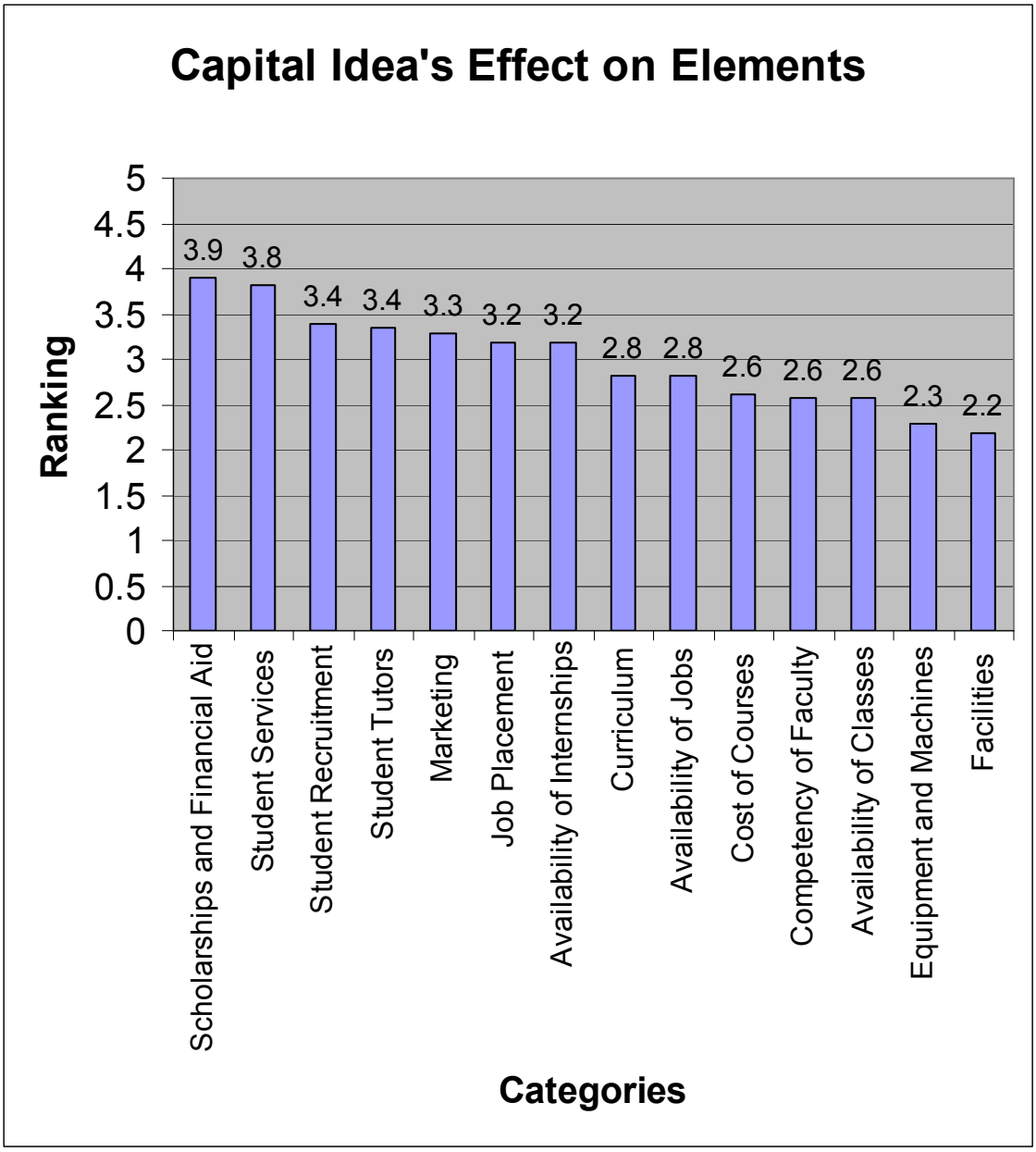
Graph F

According to the survey results, the Capital Area Training Foundation (CATF) had average to high effects on elements such as scholarships, marketing, student

recruitment, and internships. They were given the highest ratings of all the groups for the success factors scholarships/financial aid and availability of internships.

Capital Idea's Effect on Elements

The following graph, Graph G, focused on the effect that the organization, Capital Idea, had on the same descriptors.



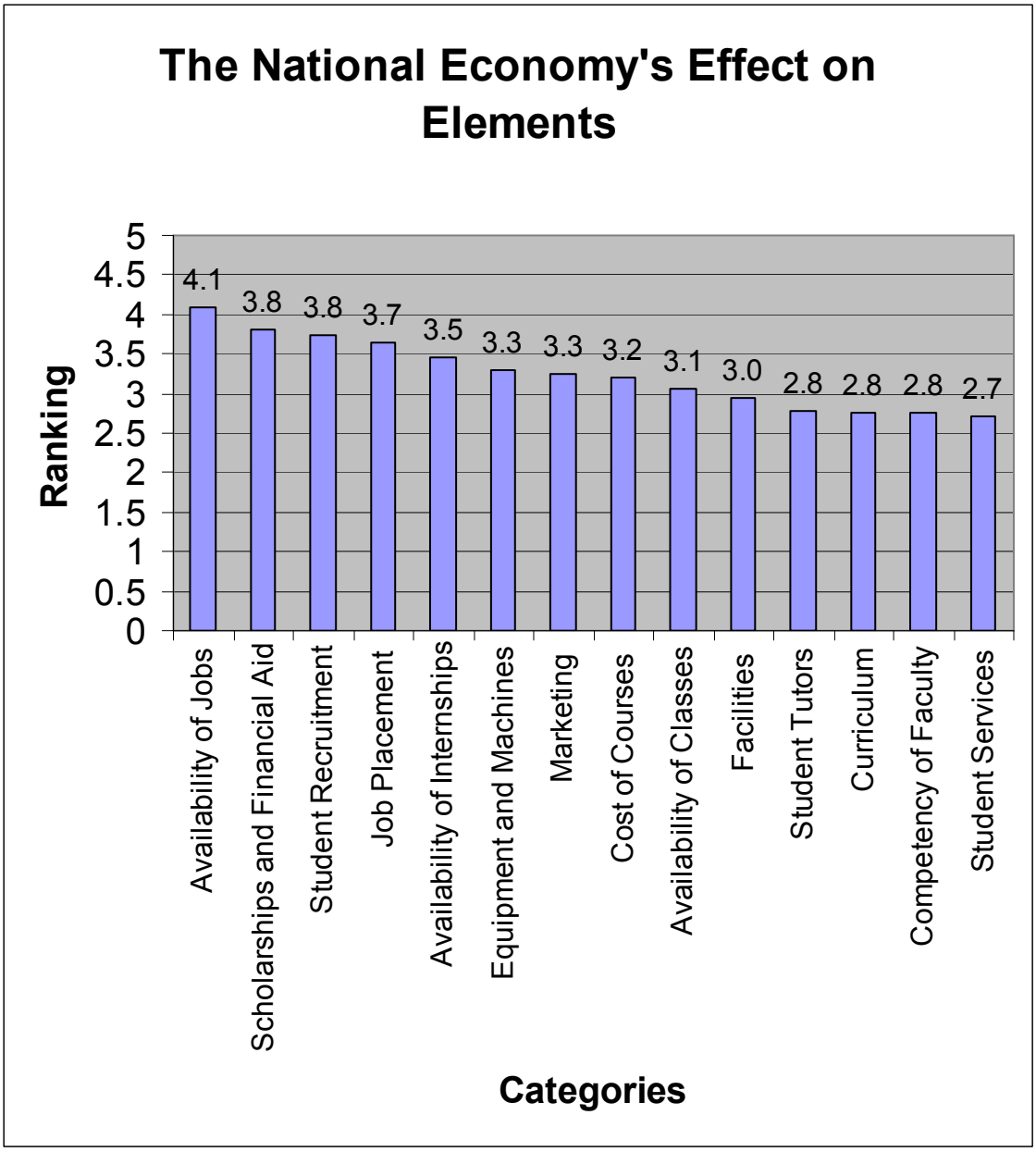
Graph G

Capital Idea guided their student clients through the program by assisting them with financial aid, counseling, and job placement. They received the highest rating in the

category student services. They also received high ratings in the areas of scholarships/financial aid, student recruitment, student tutors, and marketing.

The National Economy's Effect on Elements

The following graph, Graph H, focused on the effect that the national economy had on the same descriptors.



Graph H

The national economy, though not a partner, could not be ignored. The national economy had enormous effects on the program because it affected enrollment through

success factors such as availability of jobs, job placement, and student recruitment; those same three factors were given the highest ratings of all the groups. The national economy affected the large semiconductor employers, which, in turn, affected the local and regional economies. Layoffs became rampant in 2001 and continued in 2002 and 2003. The negative publicity had serious effects on the semiconductor program as less students were enrolling and current ones were changing majors. The national economy also may have forced some companies to look for higher returns on investments to remain competitive, by utilizing cost-cutting measures such as international outsourcing, which also had a severe morale depression on many who worked for the industry or were planning to enter it. The events of 9/11, followed by a recession in 2001, led to the worst downturn the industry had ever experienced, but by mid 2003 and early 2004, the outlook was looking much better and companies were beginning to hire.

Summary Table of Graphs

In order to summarize the many graphs that were presented, a summary table was created. The following table ranks the effects of each group on each success factor (element). The purpose is to highlight the overall effect of the groups so that we can better understand which success factors are affected by which groups and to show which individual group had the highest effect on an individual success factor. Note that the individual group with the highest mathematical average effect on a success factor is highlighted by being in bold, higher font size, and has an asterisk on its right side. For example, the success factor labeled availability of internships was affected the most (according to the participants) by the Semiconductor Executive Council because its corresponding column designation, the letter M for moderate effect, was highlighted. The effect was not H for high effect, but it still commanded the highest mathematical average for that category. The exact numerical averages and tabulations are provided in Appendix C.

Group Effect on Each Success Factor

Individual Groups

Success Factors	ACC Adm.	Faculty/Staff	Industry Advisory Board	Semiconductor Executive Council	SMT Students	Capital Area Training Foundation	Capital Idea	The National Economy
Competency of Faculty	H	**H***	M	M	M	M	L	L
Curriculum	H	**H***	H	M	M	M	M	L
Scholarships/Financial Aid	H	M	M	**H***	M	M	H	H
Equipment and Machines	H	**H***	H	H	M	M	L	M
Availability of Jobs	M	M	M	M	L	L	M	**H***
Facilities	**H***	H	M	H	L	M	L	M
Availability of Classes	**H***	H	L	L	M	L	L	M
Job Placement	M	M	M	M	M	M	M	**M***
Student Recruitment	M	M	M	L	M	M	M	**M***
Cost of Courses	**H***	M	L	L	M	L	L	M
Marketing	H	M	M	M	M	M	M	M
Student Tutors	M	**H***	M	L	M	L	M	L
Availability of Internships	M	M	M	**M***	L	M	M	M
Student Services	M	M	L	L	M	L	**H***	L

3.8-5 = High Effect (H)
2.8-3.79 = Moderate Effect (M)
1.8-2.79 = Low Effect (L)
1-1.79 = No Effect (N)

Chapter Conclusion

This chapter presented the success factors that were reported to be critical in creating and implementing a highly successful community college program, particularly a workforce program. Fourteen success factors were acquired through the survey instruments and interviews involving the different partners. The partnering groups were: A) ACC Leadership and Management, B) ACC SMT Program Faculty and Staff, C) Semiconductor Industry Advisory Board, D) Semiconductor Executive Council, E) SMT Students, F) Capital Area Training Foundation, G) Capital Idea, H) National Economy, and I) Other factors. The success factors that were derived are: competency of faculty, curriculum, scholarships/financial aid, equipment and machines, availability of jobs, facilities, availability of classes, job placement, student recruitment, cost of courses, marketing, student tutors, availability of internships, and student services. The Semiconductor Manufacturing Technology Program was then assessed on each of those success factors by the different partners, and a corresponding graph summarizing results was provided. The program was given high ratings in most of the factors that it had control over and lower ratings in factors it did not. For example, the program received high ratings in areas such as curriculum, facilities and equipment, and the competency of the faculty, but received low ratings in categories such as job placement and availability of jobs. The chapter then provided graphs depicting the effect that each partner had on each of the success factors. The results showed that different partners had varying effects on different success factors, but all of the partners contributed significantly to at least one of the success factors.

Other Implications

The following section is in addition to the data and the conclusions that were directly derived from that data. These implications, while not directly indicated by the data, are a product of both my own experiences and of defensible extensions of the data and study results. While not derived directly from the data of this study, this additional section may provide a valuable reinterpretation of the effects that the different partners had on the success factors.

The previous table summarizes the effects the different groups had on the success factors, according to the participants who answered the questionnaire. While I agree with the overall evaluations, I have disagreements with some of the results. My disagreements may stem from the fact that I had the benefit of seeing some of the events that took place from a potentially more integrated viewpoint. I worked for the SMT Program at ACC as an adjunct faculty member while simultaneously working for a local semiconductor firm, Applied Materials. Then I transferred to full-time faculty status within the program and eventually to Department Chair of the program. In these different roles, I interfaced with the various groups in varied capacities and got to see some of the background work that may have been overlooked by others, and some of the results. However, I must acknowledge that I was not aware of everything that would happen and I was not part of the program for the length of the life of the program; the program has been in existence for nine years and I was adjunct faculty for about 1.5 years and full-time faculty for 6 years after that (to the present). I was not with the program the very first years of its existence.

The Faculty and Staff Survey Results Reinterpretation

I agree that the group faculty and staff did have a high effect on success factors such as curriculum, competency of faculty, equipment and machines, and others but it must be underscored that much (the majority) of the faculty was simultaneously working for the industry or had worked substantial years for the industry. Further, some of the Industry Advisory Members were also working for the program as adjunct faculty creating a considerable overlap. Therefore, the placement of higher scores for faculty and staff without understanding and acknowledging the overlap that was common would provide an erroneous conclusion, in my opinion. Stated differently: if the faculty and staff had not worked for industry, did not work for industry, and/or had not been involved as industry advisory board members, it is very possible that the outcomes, in terms of scoring, may have been much lower in some of the key success factor categories for faculty and staff (my opinion). Therefore, I believe that while the group faculty and staff did contribute some of the highest effects on some of the categories as the survey instrument concluded, I believe that it was enabled because a majority of the faculty were or had spent many years with industry and were also involved with the industry advisory board; they, at minimum, attended some of the meetings and in some cases were integral to the discussions and activities. I also believe that members of the industry advisory board had a much higher effect on success factors such as student recruitment and marketing than what was perceived. I think that industry advisory board members would mention the program to fellow employees at their companies as a tool for them to acquire additional training and education in order to be more promotable and possibly acquire

more job security, especially industry advisory board members who were involved in roles of supervision, coaching, or training within their firms. This very important function, I believe, did occur but may have been overlooked, especially in the time that this research was performed, when the industry had suffered its worst economic downturn and companies were laying off personnel.

The Semiconductor Executive Council Survey Results Reinterpretation

I also believe that the results for the Semiconductor Executive Council were skewed somewhat, partly because of a lack of understanding about who the Semiconductor Executive Council was and what they did, especially participants such as students or other groups who may not have been well aware of their existence and function. The Semiconductor Executive Council was composed of executives representing some of the largest employers in Central Texas; their corresponding firms would pay an annual fee for participation in the Council and those and other funds would be used for administration and strategy implementation costs. For example, they were the ones that encouraged the building of a cleanroom and substantially funded it. Likewise, they would develop and fund major marketing functions to attract and train personnel for the semiconductor industry via the SMT program. Therefore, the student recruitment success factor score may have been more like an M for moderate or possibly even an H for high, but not what they actually received—an L for low. The same I would say about the success factors marketing and student recruitment. Again, their effect was probably underrated because their decisions, strategies, and implementations were

typically more privately made and, to a large extent, implemented or followed out by other groups. Therefore, many, I believe, were not aware or made to be aware of the underlying forces creating and pushing for ongoing implementations.

The Capital Area Training Foundation Survey Results Reinterpretation

I also believe that the Capital Area Training Foundation was underrated in some categories. The Capital Area Training Foundation, an arm of the Chamber of Commerce, was involved as a communications facilitator between the Semiconductor Executive Council and the SMT Program; it also provided a communication tunnel between high schools, the SMT program, and some universities, especially Texas State University (TSU). They also placed tremendous effort in marketing, coordinating, and training activities involving high school teachers, SMT teachers, and Texas State University teachers. Through their activities, many students became aware of the SMT program and the connections it had to other schools with regards to articulations between high schools, the SMT program, and TSU. However, many of those activities, while significant, were behind the scenes, so not everybody was aware that ongoing activities were occurring. Therefore, in categories such as marketing and student recruitment a rating of M may have been closer to an H. I do, however, believe that some of the categories were rightfully rated. For example, categories such as curriculum, competency of faculty, and equipment and machines were rated as M. Though they did not train the instructors or choose them, they repeatedly facilitated the acquisition of resources and equipment for faculty and program development through their influence with the Semiconductor

Executive Council. Likewise, by working with the Semiconductor Executive Council, who implemented through the Industry Advisory Board, the Capital Area Training Foundation indirectly affected curriculum development, or at least facilitated its continual improvement.

The Capital Idea Survey Results Reinterpretation

Capital Idea, a local organization whose purpose is to help financially-in-need people by facilitating an education through funds, was very active in marketing, student recruitment, in providing special student services, and in job placement for their students (their clients). They consistently recruited many students into the SMT program in the late 1990's and into the year 2000. They were especially effective in providing financial assistance by paying for their tuition, fees, and books; paying for childcare during class time, if necessary; and even paying for bus transportation if it was needed. They also provided intense counseling, as they would require their clients to attend meetings every week, at the end of the week, to discuss progress and any issues that needed to be addressed. However, from 2002 to early 2004, their marketing efforts for the SMT program declined as the industry was in a steep decline and companies were not hiring. Capital Idea received ratings of M for the categories of job placement, student recruitment, and marketing; I believe that the students who were helped before 2002 would have rated the mentioned categories as an H. I would have also agreed with those students. I did agree with the other ratings, especially the student services category,

which was given an H; they actually received the highest rating in that category of all the groups.

The National Economy

Another group that happens to not be a group but has so much significance that it had to be mentioned in this study is the national economy. The national economy got the highest ratings for the following categories: student recruitment, availability of jobs, and job placement. I could not agree more. I, however, was surprised to see that the categories student recruitment and job placement received the highest ratings of all the groups, but they were only an M. I believe that, especially in workforce programs, the national economy effect is an H not an M. Having been personally involved in many recruiting functions for the past six years, some of the top questions that students ask in deciding which type of workforce program to study in are: 'Are there jobs available? Is there job security? And how much do they pay?' In the high-tech industry of semiconductors, the national economy and foreign competition had very high effects.

Chapter Six

Study Results Part 3—What did the Workforce Program do to Adapt to a Changing Environment with A Changing Set of Needs

The Early Years: Demand for Trained Employees Was Explosive

In 1996 SMT enrollment at ACC surpassed 500 students, a time when semiconductor firms in Austin and surrounding areas could not find the numbers of qualified employees they needed to fill their factories. The need for qualified employees was so high that semiconductor-related companies were hiring headhunter-type companies. These companies were hiring people from anywhere they could find them; they brought people from other cities across the country, as well as from other companies in the region; competition for qualified people was fierce. For example, a presentation prepared by AMD in the mid 90's had a PowerPoint slide that read as follows:

The Challenge

- AMD needs about 150 wafer fab techs annually; requires 480 applicants
- Austin can absorb 800-1000 techs per year
- Enrollment in tech schools still lagging
- Fierce competition nationally and locally
- Costs 10X more to hire from outside area
- Relos have no ties to Austin

Courtesy Alyssan Peerman, AMD, Corporate Manager, Community Affairs

As More Semiconductor Firms Opened in Austin, the Need for Skilled Employees only Grew

The need for qualified employees was exaggerated when other firms such as Samsung and Tokyo Electron arrived. In the mid to late 1990's it was common to see employees 'jump' from company to company to receive higher positions, higher pay, and bonuses to make the transitions. Therefore, companies knew that something had to be done to address this major employment problem. Part of their solution was to create, develop, and maintain an SMT program at the local community college.

The Companies Start Talking Action

In 1994, AMD and Sematech initiated meetings to discuss the possibility of creating an SMT program at Austin Community College. They agreed that such a program would help alleviate the employment problem and would also assist people in the region by providing them the opportunity for an education that would get them relatively high-paying jobs. They then approached Austin Community College and the college enthusiastically agreed. Many other companies had also been working on various workforce development initiatives, but they were independently implemented—not collaboratively; by late 1995, many other companies were joining this project collaboratively. Some of those companies included Applied Materials, Texas Instruments, and Samsung. In addition, organizations such as the Capital Area Training Foundation (an arm of the Austin Chamber of Commerce) were getting involved and were implementing various strategies to coordinate activities and successfully develop workforce development systems. By late 1995, a curriculum had been developed, an industrial-style training facility had been built, and many students were enrolled in the

program. The program was perceived as a huge success by the business partners, the local community, the community college, and the students.

As Time Changed, the Industry Fell and the Program Suffered

Moving forward to the early 2001-2003 timeframe, a very different scenario had emerged. The semiconductor industry was known for its cyclic nature of ups and downs, but this time it was experiencing the most dramatic drop in sales in its history. Therefore, almost every large company was announcing layoffs; the announcements were on all news outlets—television stations, newspapers, magazines, and they were common conversation among people. Companies were not hiring—they were continuously 'laying' off. These events were tragic for SMT enrollment; some students dropped out of the program and new student enrollment also experienced a large drop. The program was created to satisfy a need in a particular place at a particular time; and it did, at an increasingly exemplary level, over time. However, changes had to be made or the fate that other similar programs around the country had met would also occur—the closing of the program.

The SMT Transformation:

The Creation of a Robotics/Automation Sister Program

SMT revived itself by looking at other needs that were existent in their service area and leveraging their strengths, to address some of the other needs. One of every four

high-technology jobs in Austin was semiconductor-related, making it the largest high-tech employer of the region. However, that meant that three out of those same four jobs were in other areas. The SMT program focused on three primary areas: electronics, processing of wafers (the chemistry aspect), and automation (the equipment component to processing). However, other types of companies also needed employees with high-level skills in automation, companies such as Dell Computers, Abott Labs, 3M, National Instruments; in addition, Toyota had plans to open a plant in San Antonio, which would result in a necessary workforce for itself and the suppliers that would support it.

The Program Responds the Same Old Way: It Partners

The SMT program responded by engaging and again partnering with many of the 'other' manufacturers and automation suppliers in the region. The semiconductor partners were also included since automation is also a central area for that industry. Together, they met formally and informally on many occasions for the purpose of developing a curriculum that would satisfy their needs. The process started in mid-2003 and by mid-2004, a very impressive (according to many engineers and technicians working for the different industries) curriculum had been developed. Initially, engineers and technicians representing the different companies were asked about the need for such a program (automation) and about the areas of technical knowledge that it would include if the goal was to make it one of the best, if not the best, in the country, at the two-year level. These meetings were initially informal and typically involved representatives from the ACC semiconductor program and representatives (i.e., engineers and technicians)

from different companies. Once a base (very preliminary) curriculum was developed through these informal meetings, representatives from the different companies were invited to be part of an official meeting to develop a more specific list of areas of technical knowledge and skills that they felt would be essential for the new program. The meeting was held at ACC's SMT program and lasted an entire day. This meeting was facilitated by ACC personnel who were not particularly knowledgeable in the subject area to insure that the outcome curriculum guide would be neutral and not biased to any particular group or partner. Personnel from the SMT program were discouraged to attend in order to avoid any potential influence that may have changed the character of the curriculum that the industry really needed.

Within a Few Months of Initial Talks with Industry,

the First New Courses Were Offered

Within approximately one month after that, a second draft curriculum had been developed and approved internally at the college. The following semester (fall 2003), the first new course (out of five new total courses developed; 20 credit hours additional) was offered; then the semester following (summer 2004), two more new courses were offered. By fall 2004, all new courses were available and graduates were expected; the first group of graduates were going to be students who had completed the SMT program and were enhancing their knowledge base by acquiring this second degree. Both the Automation, Robotics, and Controls Program curriculum and the Semiconductor Manufacturing Technology Program curriculum are located in Appendix D of this paper. To insure that

the course content quality would be superior to what was offered by other comparable programs, adjunct faculty were hired who were experts in the area, held at least a Bachelors Degree in Electrical Engineering, and worked for the companies that made the particular products that were to be taught or worked for the companies that used them extensively. For example, in a new advanced robotics course, the adjunct instructor hired was an Electrical Engineer who developed new robots for one of the largest users in the area, Applied Materials. Likewise, the adjunct instructor hired to teach advanced data acquisition and corresponding software (instrumentation) was an Electrical Engineer who worked with the software every day and also worked for the company who makes the software and hardware which is used throughout the world, National Instruments. The underlying goal of the program was to provide training and an education to people so that a significant pool of highly skilled personnel would be continuously developed in order to sustain and create more high-technology jobs in the region. In conjunction, the programs would help in sustaining a high quality of life for many; the programs intended to achieve this goal by developing and offering curriculums that would be some of the best in the country, if not the best, and knew that to achieve that goal many partnerships would be essential.

The Program Was the Perfect Sister

The curriculum focused on four areas: electronics, automation, robotics, and instrumentation. Electronics and especially automation were already well developed in the SMT program but they were further enhanced with the addition of more advanced

courses in those areas and in robotics and instrumentation. It seemed that the new program named, Automation, Robotics, and Controls was the second part or the advanced part of the SMT program (in the automation areas)—in essence, they were sister programs. The facilities were already there, much of the equipment was already there, and the high-tech community had people available that could teach the advanced courses at relatively short notice—and at a superior level because of their extensive work experience in these very technical areas. The SMT program and the new automation program were composed of approximately 20 courses each and only the last five courses were different. To further enhance relationships with the new partners—companies like Dell and Brandt and Hill, an internship course was added to the new Automation Program. This action would also help solidify the quality of the program and its graduates.

Making the Programs More Marketable Through Creative University Articulations

The program was officially started in the summer semester of 2004 and enrollment began to look promising as the first two major courses were offered. Further, to cater to the needs of the students better, who many had families and lived and worked in Austin, the SMT program initiated articulation conversations with the Texas A&M Kingsville Department of Industrial Technology. The focus was two-fold:

1) How to develop an articulation agreement toward their Bachelor of Science and Technology degree (BST) that would transfer a significant number of courses towards that degree, and
2) Could it be possible that Texas A&M Kingsville offer the remaining technical coursework for the Bachelor's degree in Austin, at ACC, and specifically at the Riverside Campus SMT Frank Squires Building (the same building where the SMT students were already housed)?

Within two months of working with Texas A&M Kingsville, ACC personnel successfully developed an articulation that would transfer about 80% (15 out of 20 courses) of the coursework to their department of technology. Further, when this document was being written, plans were being developed on how to get Texas A&M Kingsville to offer the remaining technical courses at the Frank Squires Building, and preliminary talks were very promising. Additionally, articulation agreements were also in progress with Texas State University in San Marcos, Texas (about thirty minutes driving time south of Austin).

An Immediate Student Response

As a result of the new program (Automation, Robotics, and Controls) being offered, many SMT students who were close to graduation decided to do both programs. They decided to get both Associate degrees because they knew that the knowledge to be attained would make them much more marketable; they would become even more

marketable to the relatively large semiconductor industry because they would know more about advanced automation (the semiconductor industry is surrounded by automation) and also very marketable to the industries that produced products other than semiconductors such as the Dells and Toyotas of the world. The potential benefits were enormous because they would immediately add much more hands-on knowledge to the student for a job to be acquired for the short term, but also added security and potential advancements within those firms or at other firms within or outside any particular industry. These benefits would be attained simply by taking about five additional courses!

Chapter Conclusion

The Industry Struggled in the 2001-2004 Timeframe

Concluding, this chapter analyzed what this particular program (SMT) implemented to cope with the changes that were occurring in the 2001-2004 time frame. The economy had suffered a recession and many high-technology semiconductor firms were laying off people. Further, some of these companies were expanding in other parts of the world such as China and India, where labor costs were considerably lower and highly skilled employees were readily available. With graduates struggling to get a job (not only from this program, but from most colleges and universities—in areas related to electronics) and a constant media bombardment of bad economic news, enrollment experienced a dramatic fall and so action was necessary for survival.

The Program Acted with the Addition of a Sister Program

The program acted by further nurturing their current relationships with semiconductor firms, but also by establishing additional partnerships with companies in other industries related to automation. The program was able to develop a very strong program curriculum in automation/robotics with industry and was able to do it by fully leveraging from the semiconductor program's automation and electronics courses. The program focused on developing the most technical, hands-on, and industry-relevant program that it could, so that more and more companies would join as partners. However, the personnel within the program were well aware that a strong curriculum alone would not yield success; a great program without students is as good as the mediocre one that had to close its doors. Therefore, other marketing and student benefit features needed to be included. The program then marketed the idea that students could attain two related Associate of Applied Science degrees—one in semiconductor process and automation and the second for more general manufacturing applications, but more advanced in the automation area. Both programs combined promised to provide a student very advanced industry technical skills that could be applied to a wider array of companies representing many industries. The student would be able to receive both degrees by simply taking approximately five additional courses.

The Programs Also Articulated

Further, the program initiated and successfully completed an articulation agreement with Texas A&M Kingsville's Technology program to accept approximately

80% of the courses (about 15 or 16 out of 20 courses) in either of the programs to apply towards their Bachelor of Science and Technology (BST) degree. This action would be a major marketing stimulus because in previous BST articulation agreements, few courses would transfer. Further, the Texas A&M brand name was highly sought and respected by students and employers alike. In addition to developing high transfer rate articulation agreements with Texas A&M Kingsville, negotiations were underway to find ways for Texas A&M Kingsville to offer the junior and senior-level remaining technical courses at the ACC Frank Squires building, the same building that housed the Semiconductor and Automation/Robotics Programs. If Texas A&M Kingsville would offer the remaining technical courses at the same building in Austin, many students had already pledged to join because they worked in Austin and had their homes and families there. In addition, to Texas A&M Kingsville agreements, articulations were being revised with Texas State University.

Other Marketing Implementations That Helped

To further market the programs, summer technical camps were held in the Summer of 2004 (in the Frank Squires Building) for middle school students, high school students, high school teachers, and international students; these summer camps, workshops, or internships focused on technology and were considered very successful. At the time that this paper was being written, many other initiatives were underway, including the development of a more comprehensive marketing plan, the re-evaluation of some of its first year courses, research studies to determine the potential of new areas of

workforce related to high technology such as nanotechnology, wireless technology, and biomedical instrumentation. The program diversified by offering new programs that had similarities to the existing curriculums and had the support and guidance from industry. Further, it developed creative and new articulation agreements with well-known and respected universities; extensive effort was being made to expand the number of courses that would transfer to various bachelor degrees and to find ways that those universities could teach the remaining junior and senior-level technical courses at the same facility where students where already getting their associate degree(s). All these actions fell under the theme of creating and implementing partnerships that would benefit all parties. Concluding, the program was created by partnerships; it lived and prospered through the use of partnerships; and then it evolved and diversified into other related areas by using more partners.

Chapter Seven
Conclusions, Implications, and Recommendations for Further Study

The Effect of Partnerships on the SMT Program

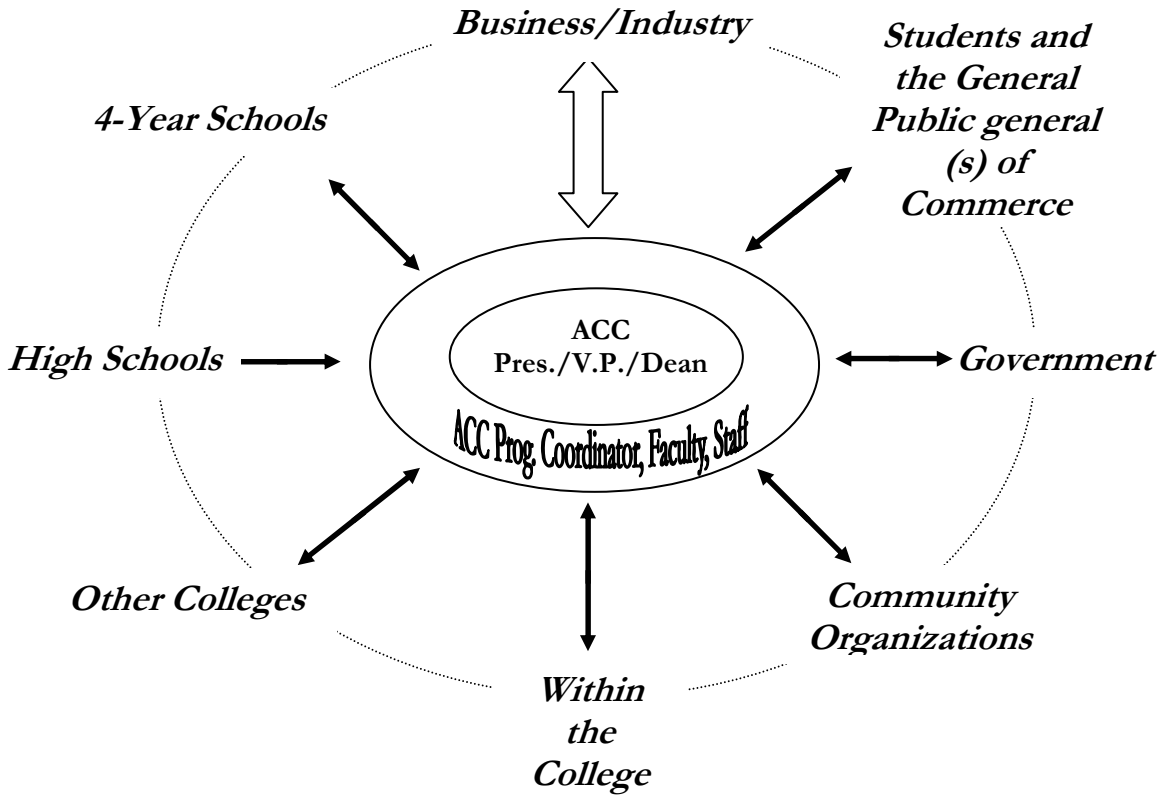
The effect of partnerships on the SMT program and other colleges noted in the paper have been highly significant in terms of the enhanced quality of education that they have been able to deliver, scholarships available, placement rates, and other factors seen as critical by these community colleges. As a result of this case study of a particular workforce program at a particular community college program, coupled with literature of other programs throughout the United States, a model was developed to provide some guidance as to what kind of partnership arrangements may be possible with a community college program. The partnering entities included business/industry, students and the general public, various governmental entities, community organizations, partnering entities within the college but from differing disciplines or areas, other community and junior colleges, high schools, and four-year schools. Each one of the eight categories may be composed of additional sub-partnership categories.

The Community College Octagonal Partnership Model

A model was derived from the research, and it portrays the shape of a wheel with eight nodes. It has thus been named the Community College Octagonal Partnership Model. It can be noted that the community college is represented at the center of the wheel, the part that provides a central joining node, a part where all the spokes connect

and communicate. The eight surrounding entities are also connected to each other via the dotted lines, but the community college appears to have the greatest opportunity to be the central and nuclear point for many of these relationships because of its mission to be of the community and for the community. Other educational institutions, such as universities, may have other more divergent mission statements and goals. The model further shows that the top administration of the college, starting with the college president, must provide the vision and the support for these partnerships. If the college president does not believe or does not get involved in such partnerships, they may never initiate, and if they do, they may not last. Other top administrators, the program chair or coordinator, the faculty and the staff are also essential key active catalyst for partnerships to work. In some cases, it may well be the faculty of a particular department who makes partnerships happen, but the support from the top is essential if these partnerships are to have long lives. The model is shown below.

The Octagonal Community College Partnership Model



Partnerships and More Partnerships Are What Made ACC's SMT Program One of the Best, If Not the Best

So what has the ACC-SMT program done that is related to the literature already discussed and why is it so highly rated by other technical programs around the U.S. and other parts of the world? It has partnered. It has taken the word partnership and used it for much of its strategic planning and implementation. ACC's SMT department has partnered with industry, local organizations (profit and non-profit), schools in Texas and throughout the U.S., with other departments within ACC, schools and institutions located

in other countries, related key technical organizations in the U.S., and with the local and state governments. The program has partnered with many entities for different reasons and yet its partnering potential has not been reached. The program has many current partnerships and was developing new ones at the time that this paper was being written. The community college department studied, caters to an industry that pays relatively well but needs many key factors, including a strong educational infrastructure to continue to exist; without educated employees who can do more than the competition, the organization is eventually taken out of the market. The program has focused many of its efforts to achieve this goal by having many joint initiatives with industry and others. The program has achieved a relatively high level of success because of its partnerships and its commitment to meeting and excelling on promises made to its partners. Partnerships have yielded the program many up-to-date and expensive tools/equipment through donations, facility donations including the semiconductor processing cleanroom, relatively easy acquisition of experienced adjunct faculty from industry, many student internships and scholarships, nearly 100% placement from 1995 to 2000 (conditions deteriorated in 2001-2004 due to local economic and industrial conditions), industry consulting, and other benefits.

Partnerships Also Have a Cost

Partnerships have done much good for the department, but they have also had significant costs. The department's faculty and staff has had to spend hundreds of hours maintaining, reevaluating, and developing partnerships. Some faculty members have

stated at times that they have felt 'partnered out.' However, some faculty members have been given monetary stipends to implement some partnership initiatives that have been more involved than others. Further, as some partnerships have involved more people, decision-making time has increased. When more people are involved, decisions are more inclusive but more time-consuming. In addition (as was discussed earlier), partnerships mean that one must 'give-in' to some issues that may be contentious. Partnerships mean that you will receive, but you will also have to give, and sometimes the giving can lead to issues that may at times seem somewhat in opposition with what you want to achieve. As discussed in the literature, a 'balance' seems to be the target goal.

Partnerships Have Costs but the Benefits Outweigh Them

It is the opinion of the author that partnerships are difficult to develop and maintain and that they can bring difficulties to the community college program, but the potential benefits can overshadow those difficulties. Further, a model has been developed from the literature and from the experiences discussed in the SMT program. The purpose of the model is to offer a checklist-type of model that can assist colleges and program administrators in thinking about the possible partnership areas that they may consider developing. The examples of ongoing partnerships and benefits attained within the SMT program are only examples of one college program. The examples provided show a brief sample of what community colleges can gain through partnerships. It is imperative that community colleges embrace the notion of partnerships as central to their strategic planning in order to meet the changing needs of their communities and of our country.

A Set of Success Factors was Developed and the Effects that the Groups had on These Factors Was Discussed

The research found that the SMT program was initiated with insistence from industry. Industry went to the college for help and Austin Community College responded. What followed was a myriad of partnerships that were developed that affected many of the most important factors (according to the survey participants) that judge the success level of a workforce program. The factors were:

1) Equipment/machines
2) Competency of Faculty
3) Facilities
4) Current and Relevant Curriculum
5) Student Services
6) Availability of Internships
7) Availability of Scholarships and /or Financial Aid
8) Jobs Availability
9) The Marketing of the Program
10) Student Job Placement
11) Competency and Availability of Student Tutors
12) Cost of Courses
13) Student Recruitment, and
14) Availability of Classes

The success factors were affected in varying ways by the different partners, as was explained in Chapter Five. Chapter Five survey results showed that the faculty, school administrators, and industry partners had some of the highest effects on the success factors. However, at the conclusion of that chapter, the author further explained the results and how the different partners may have had much more impact on results than what was perceived by the different partners.

The Monetary Benefits Were Outstanding

The monetary donations to the department were plentiful and very well received. Chapter Four showed that in the time frame 1995 to April 2002, the SMT department acquired $1,861,497.63 in donations, for an average of over a quarter million dollars a year. From 2002 to mid 2004, donations continued in the semiconductor arena but also diversified into areas of automation and robotics. For example, in early 2004, three additional industrial robots were donated for teaching the advanced robotics course; many other donations were also pending. In addition, the $1.8 million dollar figure for the 1995-2002 timeframe was actually heavily understated as many of the equipment donations were given accounting valuations many factors below what they were actually worth, if purchased on the open market.

When the Semiconductor Industry Struggled, the Program Created a Sister Program and Developed Creative Articulations

Chapter Six showed what the program did to respond to the harsh economic realities that were experienced in the high-technology sector, particularly the semiconductor industry, in Austin, Texas and surrounding communities. The program expanded its offerings in similar areas that catered to other industries and it instituted enhanced articulation agreements with universities such as Texas A&M Kingsville. Such actions increased the attractiveness of such programs by offering more value-add to the students and to the region. The program was a particular high-technology workforce

program that was initially created to cater to a specific industry in a particular part of the country at a particular time, and it did.

The Relevancy of This Case Study to Other Programs Across the Country and the Many Questions that Yet Need to Be Researched

The author believes that the conditions that occurred in this program are similar to the ones occurring at many other college programs around the country. Many programs are struggling to find ways to survive; especially programs related to electronics or other high technology areas. This research paper may provide many valuable examples of what they can also do. The implications of these results and their applications to other workforce programs throughout the country are extremely important because the future of high technology, 'in this country,' depends on what and how higher education institutions cope to the increasingly changing needs of the ever harsher global market. Further, the author believes that by studying case studies, colleges can benefit from the successes of any particular community college program, such as the SMT program at Austin Community College. Likewise, understanding some of the challenges and on-going issues may provide community college administrators with an idea of what to expect. The SMT program is an exemplary case study on partnerships, but it is the opinion of the author, that much more research is needed to find why some colleges and college programs partner more than others. The following are related questions that this study did not attempt to answer, but that also deserve serious attention. The following questions revolve around the notion that if one understands why some schools or

programs partner more than others, then that information can be used by other schools to better tool their programs, especially their workforce programs, to adapt and strive in an increasingly changing and challenging technological world.

- Is it a philosophy of a school, of a department, or of a particular person that affects whether one program or school partners more than others?
- Is the reason a difference in leadership styles, philosophies, or a combination of these variables?
- Is it the department chair, the people who work in a particular department, or the people who are over the department? If so, what is different about these people? What experiences and academic credentials do they have that may be different?
- Or is it because a particular industry is more aggressive in pursuing partnerships with community colleges than are others?
- Are some regions in the country simply more gifted with high technology companies than are others?
- Are students significant catalyst for creating partnerships? Are students more in favor of partnerships in some schools than in others and therefore they may have more influence in their creation and maintenance? If so, why?
- Are partnerships more pervasive at large urban schools, small schools, or rural schools? If so, why?
- Why is it that some programs partner much more than others, in the same school and in the same community?

- Or are the reasons that some programs partner more than others a combination of many of these factors?

Much literature exists on the benefits of partnerships between community colleges and other organizations and even on various methodologies to follow to be successful, but some colleges seem to be in the partnership headlines more than others. Therefore, much research is still needed to understand why there is a difference. It is important for colleges to understand and acknowledge the importance and potential benefit that partnerships can have on their own programs, but it is also important to understand how best to develop and sustain those partnerships for long-term survival and growth.

Appendices

Appendix A

Instrument Questionnaire A: Likert Type Questionnaire

Questionnaire Relating Partnerships Between ACC and Various Organizations and How those Partnerships have Impacted the Program

1. A) Please fill in your most appropriate status (please only select one).

◊ Current Student ◊ Previous Student
◊ Current and/or Previous Program Faculty Member
◊ Austin Community College administrator
◊ Semiconductor Industry Advisory Board Member
◊ Semiconductor Executive Council Member
◊ Company/Business Employee familiar or involved with the Program
◊ Capital Area Training Foundation (Austin Chamber of Commerce)
◊ Other Community Organizations such as Capital Idea

B) For current and previous SMT students. Please fill in the most appropriate responses:

Male ◊ Female ◊
Graduated: Yes ◊ No ◊ If Graduated, please specify semester and year
Married: Yes ◊ No ◊ ◊ Spring ◊ Summer ◊ Fall ____Year
Have Kids Yes ◊ No ◊
Age: Please write in your current age _____
Employed ◊ If so, please write in the employer and job title
_____(Employer) _____(your job title)

Ethnicity: ◊ White/Non-Hispanic ◊ Native-American
◊ Hispanic ◊ Asian-American
◊ African-American ◊ Other, please specify _____

Nationality:
◊ U.S. Citizen ◊ Foreign Student
◊ Other Category

2. In your opinion, how successful has the SMT (Semiconductor Manufacturing Technology) Program been with regards to the following elements: (please circle only one descriptor for every element).

A) Current and Relevant Curriculum
1-very poor 2-below average 3-average 4-above average 5-exemplary
B) Facilities and Equipment
1-very poor 2-below average 3-average 4-above average 5-exemplary
C) Competency of Faculty
1-very poor 2-below average 3-average 4-above average 5-exemplary
D) Competency of Graduated Students
1-very poor 2-below average 3-average 4-above average 5-exemplary
E) Availability of Scholarships and/or financial support

1-very poor 2-below average 3-average 4-above average 5-exemplary

F) Availability of Internships

1-very poor 2-below average 3-average 4-above average 5-exemplary

G) Availability of Jobs

1-very poor 2-below average 3-average 4-above average 5-exemplary

H) Overall Ranking of the Program

1-very poor 2-below average 3-average 4-above average 5-exemplary

I) Student Tutors' Effectiveness and Availability

1-very poor 2-below average 3-average 4-above average 5-exemplary

J) The Marketing of the Program

1-very poor 2-below average 3-average 4-above average 5-exemplary

K) Student Job Placement

1-very poor 2-below average 3-average 4-above average 5-exemplary

L) Student Recruitment

1-very poor 2-below average 3-average 4-above average 5-exemplary

M) Student Services Programs such as Child Care and Counseling

1-very poor 2-below average 3-average 4-above average 5-exemplary

N) Cost of courses

1-Very Expensive 2-Expensive 3-Moderately Priced 4-Low Cost 5-Very Low Cost

3. In your opinion, how important are each of the following elements in forming a successful workforce program: (please rate each element by circling the descriptor you think is most appropriate in forming any successful workforce program, including the SMT program) Please circle only one descriptor for every element.

Equipment and machines used for student training

1-Unimportant 2-Of little Importance 3-Moderately Important 4-Important 5-Very Important

Competency of Faculty

1-Unimportant 2-Of little Importance 3-Moderately Important 4-Important 5-Very Important

Facilities

1-Unimportant 2-Of little Importance 3-Moderately Important 4-Important 5-Very Important

Current and Relevant Curriculum

1-Unimportant 2-Of little Importance 3-Moderately Important 4-Important 5-Very Important

Student Services Programs such as Child Care and Counseling

1-Unimportant 2-Of little Importance 3-Moderately Important 4-Important 5-Very Important

Availability of Internships

1-Unimportant 2-Of little Importance 3-Moderately Important 4-Important 5-Very Important

Availability of Scholarships and/or financial aid

1-Unimportant 2-Of little Importance 3-Moderately Important 4-Important 5-Very Important

Jobs Availability

1-Unimportant 2-Of little Importance 3-Moderately Important 4-Important 5-Very Important

The Marketing of the Program

1-Unimportant 2-Of little Importance 3-Moderately Important 4-Important 5-Very Important

Student Job Placement (assistance in helping students get jobs)

1-Unimportant 2-Of little Importance 3-Moderately Important 4-Important 5-Very Important

Competency and Availability of Student Tutors

1-Unimportant 2-Of little Importance 3-Moderately Important 4-Important 5-Very Important

Cost of Courses

1-Unimportant 2-Of little Importance 3-Moderately Important 4-Important 5-Very Important

Student Recruitment

1-Unimportant 2-Of little Importance 3-Moderately Important 4-Important 5-Very Important

Availability of Classes
1-Unimportant 2-Of little Importance 3-Moderately Important 4-Important 5-Very Important
Other Elements you may think of _____(please write in)
1-Unimportant 2-Of little Importance 3-Moderately Important 4-Important 5-Very Important

4. The purpose of this question is to find out what you think was the effect of each of the following groups in acquiring, attaining, or implementing each of the listed elements. Please rate the effect, you think, each of the following groups had on the different elements.

A) ACC Leadership and Management

Equipment/machines used for student training
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency of Faculty
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Facilities
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Current and Relevant Curriculum
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Services Programs such as Child Care and Counseling
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Internships
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Scholarships and/or financial aid
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Jobs Availability
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
The Marketing of the Program
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Job Placement (assistance in helping students get jobs)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency and Availability of Student Tutors
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Cost of Courses
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Recruitment
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Classes
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Other Elements you may think of _____(please write in)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect

B) ACC SMT Program Faculty and Staff

Equipment/machines used for student training
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency of Faculty
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Facilities
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Current and Relevant Curriculum
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Services Programs such as Child Care and Counseling
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Internships
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Scholarships and/or financial aid
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Jobs Availability
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
The Marketing of the Program
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Job Placement (assistance in helping students get jobs)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency and Availability of Student Tutors
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Cost of Courses
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Recruitment
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Classes
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Other Elements you may think of _____(please write in)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect

C) Semiconductor Industry Advisory Board (Active Representatives from different companies who meet with ACC faculty and administrative personnel once per semester to review the program and provide guidance

Equipment/machines used for student training
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency of Faculty
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Facilities
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Current and Relevant Curriculum
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Services Programs such as Child Care and Counseling
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Internships
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Scholarships and/or financial aid
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Jobs Availability
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
The Marketing of the Program
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Job Placement (assistance in helping students get jobs)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency and Availability of Student Tutors
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Cost of Courses
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Recruitment
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Classes
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Other Elements you may think of _____(please write in)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect

D) Semiconductor Executive Council (Executives from Different Companies who meet regularly to provide overall Direction and Funding for the Program)

Equipment/machines used for student training
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency of Faculty
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Facilities
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Current and Relevant Curriculum
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Services Programs such as Child Care and Counseling
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Internships
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Scholarships and/or financial aid
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Jobs Availability
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
The Marketing of the Program
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Job Placement (assistance in helping students get jobs)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency and Availability of Student Tutors
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Cost of Courses
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Recruitment
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Classes
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Other Elements you may think of _____(please write in)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect

E) SMT Students

Equipment/machines used for student training
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency of Faculty
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Facilities
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Current and Relevant Curriculum
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Services Programs such as Child Care and Counseling
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Internships
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Scholarships and/or financial aid
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Jobs Availability
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
The Marketing of the Program
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Job Placement (assistance in helping students get jobs)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency and Availability of Student Tutors
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Cost of Courses
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Recruitment
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Classes
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Other Elements you may think of _____(please write in)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect

F) Capital Area Training Foundation (Related to the Austin Chamber of Commerce, is the facilitator between the Semiconductor Executive Council and ACC; also works to Connect ACC's SMT Program with other Local Universities and High Schools)

Equipment/machines used for student training
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency of Faculty
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Facilities
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Current and Relevant Curriculum
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Services Programs such as Child Care and Counseling
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Internships
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Scholarships and/or financial aid
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Jobs Availability
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
The Marketing of the Program
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Job Placement (assistance in helping students get jobs)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency and Availability of Student Tutors
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Cost of Courses
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Recruitment
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Classes
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Other Elements you may think of _____(please write in)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect

G) Capital Idea (Community Organization assisting students with Funding and Counseling for College Students; also work with ACC personnel on student issue improvements)

Equipment/machines used for student training
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency of Faculty
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Facilities
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Current and Relevant Curriculum
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Services Programs such as Child Care and Counseling
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Internships
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Scholarships and/or financial aid
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Jobs Availability
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
The Marketing of the Program
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Job Placement (assistance in helping students get jobs)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency and Availability of Student Tutors
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Cost of Courses
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Recruitment
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Classes
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Other Elements you may think of _____(please write in)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect

H) National Economy (The National Economy may have effects on certain elements that are not controllable by ACC or other Partners)

Equipment/machines used for student training
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency of Faculty
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Facilities
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Current and Relevant Curriculum
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Services Programs such as Child Care and Counseling
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Internships
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Scholarships and/or financial aid
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Jobs Availability
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
The Marketing of the Program
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Job Placement (assistance in helping students get jobs)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency and Availability of Student Tutors
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Cost of Courses
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Recruitment
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Classes
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Other Elements you may think of _____(please write in)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect

I) Other Factor(s) _____(Please write other factor(s) you may think may also be relevant)

Equipment/machines used for student training
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency of Faculty
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Facilities
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Current and Relevant Curriculum
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Services Programs such as Child Care and Counseling
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Internships
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Scholarships and/or financial aid
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Jobs Availability
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
The Marketing of the Program
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Job Placement (assistance in helping students get jobs)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Competency and Availability of Student Tutors
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Cost of Courses
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Student Recruitment
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Availability of Classes
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect
Other Elements you may think of _____(please write in)
1-No Effect 2-little Effect 3-Moderate Effect 4-High Effect 5-Very High Effect

Appendix B

Instrument Questionnaire B: Essay Style Questionnaire

Interview Questionnaire

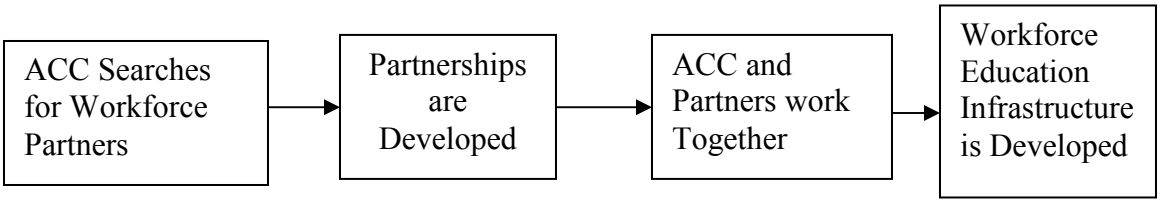
Please fill in your most appropriate status (please only select one).
◊ Current Student ◊ Previous Student
◊ Current and/or Previous Program Faculty Member
◊ Austin Community College administrator
◊ Semiconductor Industry Advisory Board Member
◊ Semiconductor Executive Council Member
◊ Company/Business Employee familiar or involved with the Program
◊ Capital Area Training Foundation (Austin Chamber of Commerce)
◊ Other Community Organizations such as Capital Idea

1. Which partnerships were developed and implemented that affected the SMT program?

2. How and in which ways were you involved in the creation or development of any of the partnerships or in the implementations resulting from such partnerships?

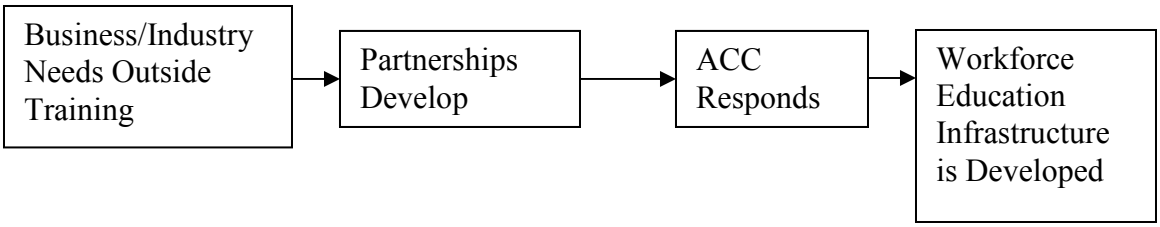
3. How did the partnerships develop (sequential diagram showing historical progression and some explanations)? Who approached who, and said or did what and in what sequence? Please draw a flow diagram that further explains your answer underneath the examples that are provided below. The examples provided below are incomplete and may not account for factors such as the economy, the individual organizations or groups that were first created that led to other groups or partnerships.

Example A:



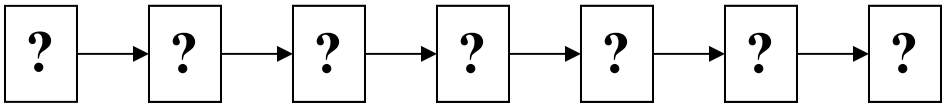
OR

Example B:



OR

Example C:



Your Flow Diagram explaining sequence of events (if possible, please provide additional written explanations underneath your sequential block diagram):

4. Given your Flow Diagram from Problem #3 and your explanation, who or what factors do you think initiate these partnerships? In other words, what factors do you think are most likely necessary for these partnerships to occur and succeed? Who most likely initiates partnerships that are long-term and have a higher probability of success? Why?

5. List major benefits that you think were attained by industry, your company or organization, the community in general, and ACC due to these partnerships.

6. What challenges did you and others in your organization encounter in the development or implementation of partnership agreements? If some of these partnership agreements or processes could have occurred differently, how could they have been better? Why?

7. In your opinion, what are the advantages and disadvantages that future partnerships may bring to different industries, a community, a community college, and organizations like yours?

8. What recommendations (with regard to partnerships) can you give to other companies and industries, organizations, and community colleges around the country that may have needs similar to organizations that partnered with ACC and its SMT Workforce Program?

Appendix C

Likert Questionnaires Response Numerical Tables

Likert Questionnaire numerical responses and averages are shown in the following tables. The left vertical axis (Y axis) shows the number representing the person being interviewed; therefore twenty-three people total completed the questionnaire. The bottom horizontal axis (X axis) shows the element or success factor being analyzed, corresponding to the vertical labels on the very bottom. Further, the horizontal row on the very bottom of the table displays the averages for all the participants, for that particular success factor. For example, participant number three (third row) rated success factor 'Equipment and Machines' a '4' and 'Competency of Faculty' a '5,' corresponding to columns one and two (also labeled on the top of the table). Further, success factor 'Equipment and Machines' received an overall average by all the participants of 4.09, as is shown on the bottom row of the table. The tables with the survey numerical tabulations and averages are shown as follows:

Questionnaire number 2. How Successful has the SMT Program been with regards to the following Elements.
1-very poor, 2-below average, 3-average, 4-above average, 5-exemplary.

Question 2

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	5	5	4	4	4	4	4	5		2	4	2	3	3
2	5	5	4	5	5	4	3	4		4	4			4
3	4	4	4	4	3	2	2	4	3	4				4
4	4	5	5	5	5	3	3	5	4	4	4	4	3	4
5	4	4	5	4	5	2	3	4	4	3	3	2	3	4
6	4	4	5					4		4				
7	5	5	3	3	3	4	3	4	5	3	3	3		4
8	5	4	5	4	5	3	3	5	5	4				
9	5	5	5	4	4	4	4	5	4	4	4	4	4	3
10	5	4	5	4	5	3	2	5	4	5	2	3	5	5
11	4	5	5	4	4	2	1	5	5	3	1	3	3	3
12	5	5	4	4	5	4	4	5	4	3	4	3	4	3
13	5	5	5	4	4	3	2	5	5	4	2	4	5	4
14	3	3	4	4	2		2	3	2	3	2	2	1	2
15	5	5	5	5	5	5	5	5	4	5	4	5	5	3
16	4	4	4	4	4	3	3	4	4	3	3	4		2
17	5	4	4	3	3	2	3	4	4	4	2	3	1	3
18	5	5	5	4	4	4	1			1	1	1		4
19	5	4	5	4	3	2	2	4	3	3	3	3	2	4
20	4	4	4	3	5	3	3	4	3	4	2	4	2	4
21	5	5	5		4	3	3	4		4	4	4		4
22	4	4	3	4	5	2	1	4	4	4	1	4	2	3
23	4	4	4	4	3	3	3	4		2		2		
	4.52	4.43	4.43	4.00	4.09	3.10	2.73	4.36	3.94	3.48	2.79	3.16	3.07	3.50
	Curriculum	Facilities & Equipment	Competency of Faculty	Student Competency	Scholorships/Financial Aid	Availability of Internships	Availability of Jobs	Ranking of Program	Student Tutors	Marketing	Job Placement	Student Recruitment	Student Services	Cost of Courses

Questionnaire number 3. How Important are Each of the following Elements in forming a Successful Workforce Program.
1-Unimportant, 2-Of Little Importance, 3-Moderately Important, 4-Important, 5-Very Important

Question 3

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	5	4	4	5	3	4	5	3	4	3	4	3	5	3
2	5	5	5	5	4	4	5	5	5	5	4	4	5	5
3	4	5	3	5	4	4	5	4	4	5	4	4	5	4
4	4	5	4	5	3	3	4	5	4	4	4	4	4	4
5	5	5	5	5	4	4	5	5	5	4	4	4	5	4
6														
7	5	5	5	5	5	5	5	5	4	5	5	5	4	5
8	5	5	4	5	2	2	5	4	3	3				
9	5	5	5	5	2	5	5	5	4	4	4	5	4	5
10	5	5	5	5	5	5	5	5	5	5	5	5	5	5
11	4	4	4	3	3	3	4	4	4	5	4	5	4	4
12	5	5	5	5	5	5	5	5	4	5	5	5	3	5
13	5	5	5	5	5	5	5	5	5	5	5	5	5	5
14	4	4	4	4	4	3	4	4	4	4	4	4	3	4
15	5	5	5	5	5	5	5	5	5	5	5	5	5	5
16	5	5	5	5	4	4	5	5	3	5	5	5	4	5
17	5	5	5	5	5	5	5	5	5	5	5	5	5	5
18	4	5	4	5	2	4	4	5	5	5	3	5	5	5
19	5	5	4	5	4	4	5	4	4	4	4	4	4	4
20	5	5	4	5	4	5	5	5	4	4	3	4	4	4
21	4	5	4	5	3	4	4	4	4	4	3	4	4	4
22	5	5	4	4	4	4	4	5	3	3	5	3	4	4
23	5	5	5	5	3	4	5	5	5	5	3	3	4	4
	4.73	4.86	4.45	4.82	3.77	4.14	4.73	4.64	4.23	4.41	4.19	4.33	4.33	4.43
	Equipment and Machines	Competency of Faculty	Facilities	Curriculum	Student Services	Availability of Internships	Scholarships/ Financial Aid	Availability of Jobs	Marketing	Job Placement	Student Tutors	Cost of Courses	Student Recruitment	Availability of Classes

Questionnaire number 4A. What Effect did the Following Group (ACC Leadership and Management) have on the Elements (Success Factors).
1-No Effect, 2-Little Effect, 3-Moderate Effect, 4-High Effect, 5-Very High Effect

Question 4A

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	4	3	4	3	2	3	3	1	2	2	1	4	2	2
2	4	4	3	4		4	3	3	4	4			3	
3	4	5	5	4	3	3	4	2	4	4	3	5	4	5
4	4	4	4	3	2	2	5	2	5	4	3	5	4	4
5	4	4	5	3	2	3	2	1	3	1	1	4	3	5
6	2	4	5	3	5	3	4	2	4	2	4	5	2	3
7	4	5	5	3	5	4	5	3	4	4	3	5	3	4
8	5	5	4	5	1	2	5	3	4	2	5	4	4	5
9	5	4	5	5	4	5	4	4	4	4	4	3	3	4
10	5	5	4	5	5	3	5	2	4	3	4	5	3	3
11	4	4	4	4	3	2	4	1	3	2	4	4	3	4
12	3	3	4	3	5	4	4	3	4	3	3	4	4	3
13	3	4	4	3	3	2	3	2	3	3	3	4	3	3
14	4	3	4	3	3	3	3	4	4	4	4	4	4	4
15	5	5	5	5	5	5	5	5	5	5	5	5	5	5
16	4	4	4	4	3	3	4	5	4	3	3	5	3	3
17	5	4	5	5	2	2	4	2	3	1	5	3	3	4
18	4	2	5	2		5	5	5	5	4	1	3	5	5
19	5	4	4	4	5	4	4	3	4	4	3	5	5	5
20	4	4	4	5	2	3	5	3	4	3	4	4	4	4
21	4	4	4	5	3	3	3	4	4	4	3	4	4	4
22	4	4	4	4	3	3	3	4	3	4	4	3	4	4
23	4	4	4	4	3	4	4	4	4	5	2	3	4	4
	4.09	4.00	4.30	3.87	3.29	3.26	3.96	2.96	3.83	3.26	3.27	4.14	3.57	3.95
	Equipment and Machines	Competency of Faculty	Facilities	Curriculum	Student Services	Availability of Internships	Scholarships and Financial Aid	Availability of Jobs	Marketing	Job Placement	Student Tutors	Cost of Courses	Student Recruitment	Availability of Classes

Questionnaire number 4B. What Effect did the Following Group (ACC SMT Program Faculty and Staff) have on the Elements (Success Factors).
1-No Effect, 2-Little Effect, 3-Moderate Effect, 4-High Effect, 5-Very High Effect

Question 4B

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	5	4	3	5	2	3	3	1	2	3		3	3	4
2	5	4	2	4		2	2	2					2	3
3	4	5	3	4	2	2	2	2	3	4	4	1	4	2
4	4	5	3	5	2	3	2	3	4	4	4	2	4	5
5	4	3	2	4	2	3	1	1	4	2	4	1	5	4
6	5	5	4	4	3	2	3	2	4	3	5	2	5	3
7	4	5	4	5	3	5	3	2	2	2	5	2	3	4
8	5	5	4	4	4	3	5	3	3	3	5	4	4	5
9	5	4	5	5	4	5	4	4	4	4	4	3	3	4
10	5	5	4	4	5	3	5	2	3	3	4	5	3	3
11	4	4	4	4	3		4	1	3	1	4	3	3	3
12	5	5	5	5	3	4	4	4	4	4	5	3	3	5
13	5	5	4	4	3	3	3	3	4	3	5	3	3	3
14	4	4	4	4	3	3	4	4	3	3	3	4	4	4
15	5	5	5	5	5	5	5	5	5	5	5	5	5	5
16	5	5	4	5	5	2	2	4	5	5	5	3	3	5
17	5	5	5	5	1	1	4	2	4	1	5	3	3	4
18	5	4	5	5	2	2	2	1	1	2	3	1	3	4
19	5	5	4	5	4	4	4	5	4	4	4	4	4	4
20	4	4	4	5	4	3	5	3	4	3	4	4	4	4
21	4	5	4	5	3	3	3	4	4	3	3	4	4	4
22	5	4	4	4	4	3	3	4	3	4	3	3	3	4
23	4	4	4	5	2	3	3	4	4	4	2	3	3	3
	4.61	4.52	3.91	4.57	3.14	3.05	3.30	2.87	3.50	3.18	4.10	3.00	3.52	3.87
	Equipment and Machines	Competency of Faculty	Facilities	Curriculum	Student Services	Availability of Internships	Scholarships and Financial Aid	Availability of Jobs	Marketing	Job Placement	Student Tutors	Cost of Courses	Student Recruitment	Availability of Classes

Questionnaire number 4C. What Effect did the Following Group (Semiconductor Industry Advisory Board) have on the Elements (Success Factors).
1-No Effect, 2-Little Effect, 3-Moderate Effect, 4-High Effect, 5-Very High Effect

Question 4C

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	2	3	2	4	1	2	3	1	1	2		1	2	1
2	3	2	3	3		4	5	5	3	4				2
3	5	3	4	4	1	4	4	5	4	4	1	1	3	1
4	4	4	3	5	1	3	2	5	4	3	2	1	2	3
5	4	2	4	4	1	5	5	3	4	3	1	1	2	1
6	2	4	2	4	1	2	1	2	2	2	4	1	2	4
7	4	3	3	5	2	5	5	5	4	5	2	2	3	3
8	5	5	4	4		3	5	3	3	3	5	3	3	5
9	5	3	4	5	1	3	2	4	3	3	2	2	2	3
10	4	4	4	3	3	3	5	2	3	3	3	5	3	3
11	4	4	4	4	4	4	4	1	3	1	4	3	4	3
12	5	3	3	4	2	4	5	5	3	4	2	2	3	1
13	3	3	3	3	3	3	3	3	3	3	3	3	3	3
14	4	3	4	3	3	3	3	3	3	3	3	4	3	3
15	5	5	5	5	5	5	5	5	5	5	5	5	5	5
16	5	2	2	2	1	2		4	3	3	2	2	2	2
17	3	3	3	4	1	1	3	1	3	1	2	4	3	3
18	3	1	2	4	1	1	1	3	3	2	1	1	2	1
19	5	3	4	4	2	3	3	3	3	2	2	1	2	2
20	4		4	4	1	3	5	4	4	3	1	1	4	1
21	5	4	5	5	3	4	4	4	4	4	3	4	4	4
22	4	4	4	4	2	4	3	3	3	3	3	3	3	3
23	5	5	5	5	1	5	5	5	3	5	1	1	3	2
	4.04	3.32	3.52	4.00	1.90	3.30	3.68	3.43	3.22	3.09	2.48	2.32	2.86	2.57
	Equipment and Machines	Competency of Faculty	Facilities	Curriculum	Student Services	Availability of Internships	Scholarships and Financial Aid	Availability of Jobs	Marketing	Job Placement	Student Tutors	Cost of Courses	Student Recruitment	Availability of Classes

Questionnaire number 4D. What Effect did the Following Group (Semiconductor Executive Council) have on the Elements (Success Factors).
1-No Effect, 2-Little Effect, 3-Moderate Effect, 4-High Effect, 5-Very High Effect

Question 4D

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	Equipment and Machines	Competency of Faculty	Facilities	Curriculum	Student Services	Availability of Internships	Scholarships and Financial Aid	Availability of Jobs	Marketing	Job Placement	Student Tutors	Cost of Courses	Student Recruitment	Availability of Classes
1	4	2	4	3	1	2	3	1	2	1		2	2	1
2	4	1	5	3		5	5	5	4	5		4	3	3
3	5	3	4	3	1	4	4	5	2	4	1	1	3	1
4	5	3	4	3	3	4	5	5	4	4	2	1	4	2
5	4	1	5	4	1	5	5	3	4	2	1	1	2	1
6	5	4	4	4	1	4	4	2	2	3	3	3	1	4
7	5	3	5	5	2	5	5	5	3	5	1	1	2	4
8	5	4		4		3	5	3	4	5	5		3	5
9	5	4	3	3	2	3	3	3	4	3	3	1	2	2
10	4	4	4	3	3	3	5	3	3	3	3	3	3	3
11	3	3	3	3	3	3	3	1	3	1	3	3	2	3
12	5	2	3	3	2	5	5	5	3	4	2	2	2	2
13	3	3	3	3	3	3	3	3	3	3	3	3	3	3
14	4	3	3	3	3	3	3	3	3	3	3	4	3	3
15	5	5	5	5	5	5	5	5	5	5	5	5	5	5
16	4	3	3	3	1	4	2	4	3	4	2	2	3	2
17	4	4	4	4	1	2	4	2	2	1	2	3	2	3
18	4	1	4	3	1	3	4	4	5	4	1	1	3	1
19	5	3	3	4	2	3	3	3	3	3	1	1	2	2
20	4	3	5	4	1	4	5	5	5	4	2	4	4	1
21	5	4	5	5	3	3	4	4	4	4	3	3	4	3
22	3	3	3	4	3	3	4	4	4	4	3	3	3	3
23	5	5	5	5	2	4	3	3	4					
	4.35	3.09	3.95	3.65	2.10	3.61	4.00	3.52	3.43	3.41	2.45	2.43	2.77	2.59

Questionnaire number 4E. What Effect did the Following Group (SMT Students) have on the Elements (Success Factors).
1-No Effect, 2-Little Effect, 3-Moderate Effect, 4-High Effect, 5-Very High Effect

Question 4E

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	3	1	2	3	2	2	2	1	1	1		2	2	1
2	2	1	1	2	4	3	4	4	3	3				3
3	1	1	1	2	3	2	2	1	5	5	3	1	5	1
4	2	3	2	3	3	2	4	2	3	1	3	2	3	3
5	3	2	1	2	2	1	1	1	4	4	4	1	4	4
6	2	2	1	1	1	3	2	2	4	3	4	3	2	3
7	1	3	1	2	4		3	1	4	3	5	2	4	4
8	5	5	4	3	2	3	5	3	3	3	5	4	3	5
9	4	4	3	5	2	2	4	3	3	3	4	2	2	2
10	4	5	5	5	5	5	4	2	3	3	5	3	3	1
11	4	4	5	4	3	4	5	1	4	1	4	3	3	4
12	3	3	3	3	4	3	3	3	3	3	2	2	2	1
13	2	3	3	2	3	1	2	1	3	2	5	2	2	3
14	4	4	4	4	3	3	3	2	3	3	3	4	3	4
15	5	5	5	5	5	5	5	5	5	5	5	5	5	5
16	3	2	2	3	1	4	4	3	3	4	4	4	3	3
17	5	5	5	4	1	1	3	1	2	1	4	3	1	3
18	1	1	1	1	1	1	1	1	1	2	1	1	2	1
19	3	2	1	4	2	2	2	1	2	3	3	1	2	3
20	5	4	4	5	5	4	4	4	4	4	4	3	4	4
21	2	2	2	3	4	2	2	2	4	2	3	2	4	2
22														
23														
	3.05	2.95	2.67	3.14	2.86	2.65	3.10	2.10	3.19	2.81	3.74	2.50	2.95	2.86
	Equipment and Machines	Competency of Faculty	Facilities	Curriculum	Student Services	Availability of Internships	Scholarships and Financial Aid	Availability of Jobs	Marketing	Job Placement	Student Tutors	Cost of Courses	Student Recruitment	Availability of Classes

Questionnaire number 4F. What Effect did the Following Group (Capital Area Training Foundation) have on the Elements (Success Factors).
1-No Effect, 2-Little Effect, 3-Moderate Effect, 4-High Effect, 5-Very High Effect

Question 4F

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	3	2	3	2	1	2	3	1	2	2		1	3	1
2	2	2	2	1		4	5	5	5	4			5	
3	4	1	5	3	1	5	5	1	4	3	1	1	3	1
4	3	3	2	3	2	3	3	2	3	2	1	1	2	2
5	4	2	4	4	2	4	5	2	4	1	1	1	3	1
6	2	2	2	3	1	3	3	3	4	3	1	2	4	2
7	2	2	2	2	4	4	4	3	5	3	3	4	5	3
8	4	4	4	4	2	3	5	3		3	5	3	3	4
9	4	4	4	4	2	3	3	3	4	4	3	3	4	4
10	4	5	4	4	5	5	5	3	4	4	5	4	5	5
11	2	2	1	2	3	3	3	1	2	1	3	2	2	2
12	2	2	2	2	4	5	5	4	3	4	2	2	4	2
13	2	2	2	2	2	2	2	2	2	2	2	2	2	2
14	4	4	4	4	3	3	3	3	4	3	3	4	3	4
15	5	5	5	5	5	5	5	5	5	5	5	5	5	5
16	2	3	2	3	4	4	4	5	4	4	3	4	3	3
17	3	4	3	2	1	1	1	2	2	1	1	3	2	2
18	3	3	3	2	1	3	3	2	3	3	1	1	2	1
19	3	2	2	2	1	1	2	1	2	2	1	1	2	2
20	1	1	1	4	1	4	4	4	5	3	1	1	5	1
21	4	4	4	5	3	4	4	2	4	3	3	2	4	2
22														
23														
	3.00	2.81	2.90	3.00	2.40	3.38	3.67	2.71	3.55	2.86	2.37	2.35	3.38	2.45
	Equipment and Machines	Competency of Faculty	Facilities	Curriculum	Student Services	Availability of Internships	Scholarships and Financial Aid	Availability of Jobs	Marketing	Job Placement	Student Tutors	Cost of Courses	Student Recruitment	Availability of Classes

Questionnaire number 4G. What Effect did the Following Group (Capital Idea) have on the Elements (Success Factors).
1-No Effect, 2-Little Effect, 3-Moderate Effect, 4-High Effect, 5-Very High Effect

Question 4G

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	2	1	2	4	3	3	2	2	3		2	3	2
2	1	2	2	2	4	4	4	4	5	4	4	3	4	4
3	1	2	1	2	5	3	3	1	4	4	4	1	5	1
4	1	1	1	2	3	1	3	1	3	1	3	1	3	1
5	1	1	1	1	5	4	5	3	4	3	3	1	4	4
6	1	1	1	2	4	1	4	1	1	1	3	2	1	1
7	1	3	1	3	2	3	3	2	2	2	3	2	3	2
8	4	4	4	4	5	4	5	3	3	3	5	3	3	4
9	4	3	3	4	2	5	5	5	4	5	3	3	3	2
10	4	5	4	5	5	5	5	3	4	3	4	4	3	3
11	2	2	2	2	2	1	2	1	2	1	2	2	2	2
12	3	3	3	2	4	5	5	5	4	4	2	2	5	2
13	3	4	3	3	4	3	4	3	4	3	4	3	3	4
14	4	4	3	3	3	3	3	2	3	3	3	4	3	4
15	5	5	5	5	5	5	5	5	5	5	5	5	5	5
16	2	2	2	3	4	3	3	4	3	4	3	3	3	2
17	4	4	3	3	2	2	5	2	3	3	3	3	3	3
18														
19	2	2	2	2	3	2	3	2	3	3	4	4	4	3
20	1	1	1	4	5	4	4	4	4	5	3	1	4	1
21	2	2	2	4	4	3	4	2	3	3	4	2	4	2
22	1	1	1	1	5	3	4	4	3	4	2	4	3	2
23														
	2.29	2.57	2.19	2.81	3.81	3.19	3.90	2.81	3.29	3.19	3.35	2.62	3.38	2.57
	Equipment and Machines	Competency of Faculty	Facilities	Curriculum	Student Services	Availability of Internships	Scholarships and Financial Aid	Availability of Jobs	Marketing	Job Placement	Student Tutors	Cost of Courses	Student Recruitment	Availability of Classes

Questionnaire number 4H. What Effect did the Following Element (National Economy) have on the Elements (Success Factors).
1-No Effect, 2-Little Effect, 3-Moderate Effect, 4-High Effect, 5-Very High Effect

Question 4H

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	2	2	3	3	3	4	4	5	3	4		3	4	2
2	4	3	3	2	4	5	4	5	5	5	4	4	5	4
3	2	2	2	1	1	5	4	5	3	1	1	2	3	1
4	4	3	3	3	2	3	4	5	5	4	3	2	5	3
5														
6	4	2	4	3	1	5	4	5	2	5	2	5	5	4
7	4	1	4	3	4	4	4	5	2	5	2	3	4	5
8	4	4	3	4	4	3	5	3	3	3	5	3	5	4
9	4	3	2	2	2	4	4	4	4	4	3	4	4	1
10	2	2	2	1	2	1	1	2	2	2	2	2	2	2
11	1	1	1	1	1	1	2	1	1	1	1	1	1	1
12	5	5	5	5	5	5	5	5	5	5	5	5	5	5
13	3	4	4	3	3	2	3	2	2	2	3	3	2	3
14	4	4	3	3	3	3	3	2	3	3	3	4	3	4
15	5	5	5	5	5	5	5	5	5	5	5	5	5	5
16	4	3	4	3	4	4	5	5	3	4	3	5	3	4
17	4	2	1	4	1	3	5	5	4	5	3	3	3	3
18	2	1	2	2	1	2	2	5	5	5	1	1	5	1
19	1	1	1	1	2	1	3	3	1	1	1	1	3	1
20	4	4	4	4	3	4	4	5	4	5	3	5	5	5
21	3	3	3	2	3	5	5	5	3	4	3	3	3	3
22														
23														
	3.30	2.75	2.95	2.75	2.70	3.45	3.80	4.10	3.25	3.65	2.79	3.20	3.75	3.05
	Equipment and Machines	Competency of Faculty	Facilities	Curriculum	Student Services	Availability of Internships	Scholarships and Financial Aid	Availability of Jobs	Marketing	Job Placement	Student Tutors	Cost of Courses	Student Recruitment	Availability of Classes

Appendix D

The SMT and Automation, Robotics, and Controls Curriculums

This appendix lists the curriculums for the Semiconductor Manufacturing Technology Program (SMT) and the newly developed Automation, Robotics, and Controls Program. Both areas offer an Associate of Applied Science Degree (AAS) and a Certificate (one-year) program. Note that roughly 75% of the content in both Associate degrees are the same (semesters one, two, and three are almost identical; semesters four and five depict the differences in specialty).

The following curriculum corresponds to the Associate of Applied Science Degree in Electronics with the Specialty in Semiconductor Manufacturing Technology.

Austin Community College
PROPOSED
FY 2004-2005 Degree Plan
Electronics
SEMICONDUCTOR MANUFACTURING TECHNOLOGY
Associate of Applied Science Degree

					Credit Hours
Semester I					
	+	CETT	1403	DC Circuits	4
	+	**MATH**	**1314**	College Algebra	3
		SPCH		Oral Communications[1]	3
	+	PTAC	2314	Principles of Quality	3
		ENGL	**1301**	English Composition I	3

					16
Semester II					
	+	CETT	1405	AC Circuits	4
		COSC	1315	Fundamentals of Programming	3
	+	CETT	1425	Digital Fundamentals	4
	+	PHYS	1401	General College Physics I	4

					15
Semester III					
	+	**CHEM**	**1405**	Introduction to Chemistry	4
	+	CETT	1429	Solid State Devices	4
	+	CETT	1445	Microprocessor	4

					12
Semester IV					
	+	ELMT	2441	Electromechanical Systems	4
		SMFT	1473	Semiconductor Manufacturing Technology I	4
	+	INTC	2471	Data Acquisition and Measurement	4
				Social and Behavioral Science[2]	3

					15

Semester V

+	SMFT	2473	Semiconductor Manufacturing Technology II	4
+#	SMFT	2472	Semiconductor Equipment Operation and Maintenance	4
+	SMFT	2341	Vacuum Principles & RF Plasma Systems	3
+			Humanities/Fine Arts[3]	3

				14

			TOTALS	**72**

+ Prerequisites: See Catalog Descriptions.

[1] Select from Oral Communications section of the General Education Course list.
[2] Select from Social/Behavioral Science section of the General Education Course list.
[3] Select from Humanities/Fine Arts section of the General Education Course list.

The following curriculum corresponds to the Certificate Degree in Electronics with the Specialty in Semiconductor Manufacturing Technology.

SEMICONDUCTOR MANUFACTURING TECHNOLOGY SPECIALIST
Certificate

Semester I					
	+	CETT	1403	DC Circuits	4
		PTAC	2314	Principles of Quality	3
	+	**MATH**	**1314**	College Algebra	3
		ENGL	**1301**	English Composition I	3
					13
Semester II					
	+	CETT	1405	AC Circuits	4
		SMFT	1473	Semiconductor Manufacturing Technology I	4
	+	PHYS	1401	General College Physics I	4
	+	**CHEM**	**1405**	Introduction to Chemistry	4
					16
Semester III					
	+	CETT	1429	Solid State Devices	4
	+	SMFT	2473	Semiconductor Manufacturing Technology II	4
					8
				TOTALS	**37**

+ Prerequisites: See Catalog Descriptions.

The following curriculum corresponds to the Associate of Applied Science Degree in Electronics with the Specialty in Automation, Robotics, and Controls.

Electronics Technology

Automation, Robotics and Controls Technology

Associate of Applied Science Degree

Semester I			**Credit Hours**
+ CETT1403		DC Circuits	4
+ **MATH**	**1314**	College Algebra	3
ENGL	**1301**	English Composition I	3
+	**Humanities/Fine Arts**[1]	***3***	
	Social and Behavioral Science[2]	***3***	
			16

Semester II			
+ CETT1405		AC Circuits	4
SMFT	1341	Manufacturing Methods	3
	Oral Communications[3]	3	
+ CETT1425		Digital Fundamentals	4
			14

Semester III

+ CETT1429		Solid State Devices	4
+ INTC	2471	Data Acquisition and Measurement	4
+ ELMT	2441	Electromechanical Systems OR	4
+ ELMT	2433	Industrial Electronics	
+ CETT1445		Microprocessor	4
			16

Semester IV

+	RBTC	1405	Robotics Fundamentals	4
+	INTC	2433	Instrumentation and Installation	4
	INMT	1441	Computer Integrated Manufacturing	4
				12

Semester V

+	ELPT	2449	Industrial Automation	4
	RBTC	2433	Robotics	4
#	EECT	2488	Internship	4
				12
	TOTALS			**70**

+ Prerequisites: See Course Descriptions.

Capstone course

1 Select from Humanities/Fine Arts section of the General Education Course list.

2 Social and Behavioral Science section of the General Education Course list.

3 Select Oral Communications from General Education Course List.

The following curriculum corresponds to the Certificate Degree in Electronics with the Specialty in Automation, Robotics, and Controls.

Electronics Technology

Automation, Robotics and Controls Technology

Certificate

Semester I		**Credit Hours**
+ CETT1403	DC Circuits	4
+ CETT1405	AC Circuits	4
+ **MATH 1314**	College Algebra	3
SMFT 1341	Manufacturing Methods	3
		14
Semester II		
+ CETT1429	Solid State Devices	4
+ CETT1425	Digital Fundamentals	4
+ CETT1445	Microprocessor	4
		12
Semester III		
+ ELMT 2441	Electromechanical Systems OR	4
+ ELMT 2433	Industrial Electronics	
+ INTC 2471	Data Acquisition and Measurement	4
# RBTC 1405	Robotics Fundamentals	4
		12
TOTALS		**38**

+ Prerequisites: See Course Descriptions.
# Capstone course

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