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An assessment to determine the needs for a master of science degree program in industrial studies at San Jose State University

Lindia Lee Gordon
San Jose State University

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degree program in Industrial Studies at San Jose State
University**

Gordon, Lindia Lee, M.A.

San Jose State University, 1990

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Ann Arbor, MI 48106**

**AN ASSESSMENT TO DETERMINE THE NEEDS FOR A MASTER OF
SCIENCE DEGREE PROGRAM IN INDUSTRIAL STUDIES AT SAN JOSE
STATE UNIVERSITY**

A Thesis

Presented to

The Faculty of the Division of Technology

San Jose State University

In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

By

Lindia Lee Gordon

May, 1990

APPROVED FOR THE DIVISION OF TECHNOLOGY

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Abstract

AN ASSESSMENT TO DETERMINE THE NEEDS FOR A MASTER OF SCIENCE DEGREE PROGRAM IN INDUSTRIAL STUDIES AT SAN JOSE STATE UNIVERSITY

by Lindia Lee Gordon

This thesis addresses the topic of the need for a Master of Science degree program in Industrial Studies at San Jose State University. It examines the educational needs of former students of the Division of Technology and the requirements of industrial employers. In addition, scheduling and the types of classes expected in a masters degree program, as well as the most appropriate masters degree for employees and Division of Technology graduates were studied.

Research on the subject reveals that according to respondents, the Master of Science degree is the most appropriate degree type for industrial technology graduates working in industries within the Santa Clara Valley. Requirements for industrial technology graduates are expected to change in specific ways in the next five years and prospective graduate students are interested in technical specialization at the masters level.

Acknowledgements

Special thanks to my future husband Fred for his never-ending support and faith in my abilities and to my family who have always been accepting of my dreams.

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List of Abbreviations

BAIA -	Bachelor of Arts Industrial Arts
BSET -	Bachelor of Science Engineering Technology
BSIT -	Bachelor of Science Industrial Technology
CAD -	Computer - Aided Design
CAE -	Computer - Aided Engineering
CAM -	Computer - Aided Manufacturing
CIM -	Computer - Integrated Manufacturing
CSU (System) -	California State University System
MAIS -	Master of Arts Industrial Studies
MBA -	Master of Business Administration
MSIS (or IT) -	Master of Science Industrial Studies (or Industrial Technology)
MSQA -	Master of Science Quality Assurance
SJSU -	San Jose State University

Chapter I - Introduction

In 1961, a Dr. Weber of Pennsylvania State University (1961, pp. 171-172) designed an instrument to determine what programs of industrial technology are, their purposes, and how these programs differ from other industrial or technical education programs. The following conclusions were made:

- Industrial technology could be defined as an educational program designed to give the student an insight into how goods are produced, a knowledge of the problems of management and distribution, and an ethical foundation for making decisions.
- Industrial technology programs have the following characteristics:
 - Purposes are management-oriented rather than engineering-oriented.
 - Curricula are general in nature rather than specialized.
 - A variety of courses with hands-on experiences is required.
- The chief purposes of industrial technology programs are concerned with the preparation of students for positions of leadership in manufacturing industries.
- The results of the study clearly indicate that industrial technology programs are quite different from industrial arts education and technical institute training programs. Industrial technology programs are not engineering-oriented, nor are they teacher education programs. The main difference is in the general area of preparing students for positions in management.

According to McLuckie and Sutton (1986) the *National Association of Industrial Technology 1985-1986 Directory* indicates that 34 out of 136 schools have masters degree programs available. However, not all of the programs are industrial technology programs. Listed in Table 1 are the titles of these programs, the number of undergraduate students at these institutions, and the number of graduate students enrolled at these institutions (McLuckie & Sutton, p. 59).

Table 1- Number of Industrial Technology- Related Masters Degree Programs

Degree Name/Type	Undergraduate	Graduate	%(G/U)
Industrial Arts or Industrial Ed. (12 Schools)	4,290	323	7.5
Industrial Technology (15 Schools)	5,128	260	5.0
Schools that offer IT and IA (3 Schools)	1,841	358 IT 50 IA	19.0 2.0
Industrial Supervision or Organization and Management (3 Schools)	2,634	321	12.0
Engineering Technology (1 School)	125	45	36.0
Totals 34 Schools	14,018	1,357	9.0

What is most significant about this table are the totals and final percentage, which is nine percent. Based on this figure, one would expect a graduate program to have an enrollment of nine percent of the

undergraduate major enrollment at an institution to be consistent with the national average. This gives a planning figure for program development. An additional finding from the Directory was that the total enrollment in bachelor's degree programs for all schools was 35,139 students. If the nine percent figure is an indicator, then there is a potential of 3,162 graduate students of whom only 1,357 are now being served (McLuckie & Sutton, 1986, p. 60).

Background

Santa Clara Valley. The Santa Clara Valley is located in Northern California and is the hub of "Silicon Valley." The valley is the home of numerous high-technology industries that produce items ranging from computer chips to defense mechanisms for the United States Government. The industries in the valley are very dynamic; on any given day companies merge, go public, and many small companies emerge as giants overnight. There are constant changes as to the needs of these industries. Employees must be kept on the leading edge of training and development in their field in order to produce the latest in high-technology (SJSU Graduate Catalog, 1988-90).

The University. San Jose State University, founded in 1857, is the oldest member of the California State University system and the oldest public institution of higher education in California. The university is located in Santa Clara County, the hub of "Silicon Valley." Graduates from San Jose State work successfully in virtually all professions and levels of government (SJSU Graduate Catalog, 1988-90).

The Division of Technology. The Division of Technology at San Jose State University is administered under the School of Applied Arts and Sciences. The Industrial Technology program was converted from the Business and Industry program in the late 1960's. The Division offers majors in both Industrial Technology and Industrial Arts, in addition to Industrial Arts Teacher Education and minors in both Industrial Technology and Industrial Arts.

As stated in the Mission Statement from the Division of Technology, the Industrial Technology program at San Jose State University provides management-oriented technical curricula based on a balanced program of studies drawn from a variety of disciplines related to industry. Included are a sound knowledge and understanding of materials and production processes, experience in communication skills, studies in the humanistic and social implications of technology, and required proficiency in mathematics, chemical and physical sciences, design, and technical skills (Mission Statement, Division of Technology, 1990).

Graduate Programs in the Division of Technology. The Division offers a Master of Arts degree in Industrial Studies with emphases in both Industrial Technology and Industrial Technology Education, and a Master of Science degree in Quality Assurance. The Division currently enrolls over 650 undergraduate majors, 30 Master of Arts students and 58 Master of Science Quality Assurance students (D. Betando, personal communication, April, 1990).

Some of the goals of the Industrial Technology major program are to:

- offer curricula and facilities which accurately describe and represent our modern industrial/technical society;
- provide sufficient knowledge of the theories, concepts, and principles of the humanities and the social behavioral sciences;
- develop the understanding of, and the ability to apply, principles and concepts of mathematical, physical, and biological sciences; and,
- provide for the application of concepts and the development of skills in a variety of technical disciplines. These include materials and production processes, industrial management and human relations, marketing, communications, electronics, computers, quality assurance, and graphic communications (Mission Statement, Division of Technology, SJSU, 1990).

Industrial Technology majors are prepared to enter industry in management and supervisory positions in one or more of the fields such as:

- Energy, Power, and Control Technology
- Computer Electronics Technology
- Design and Technical Drawing Technology
- Graphic Communications and Production Technology
- Packaging Technology
- Manufacturing Technology
- Quality Assurance Technology

Considered as a whole, the graduate student enrollment in the Master of Arts Industrial Studies (24 students) and the Master of Science Quality Assurance (58 students) degree programs amount to 13% of the population of 650 majors in the Division of Technology. It should be noted however, that the 58 masters degree students enrolled in the MSQA degree program represent only one of the seven areas of concentration at the

baccalaureate degree level in the Division of Technology. Furthermore, many of these students are not Division of Technology graduates. Therefore, it is unreasonable to include this entire group in determining the ratio of graduates to undergraduates for comparison to ratios in other schools.

Taken separately, the enrollment of the MAIS degree program is less than 4 percent of the total undergraduate majors enrolled at this institution, which is well below the national enrollment average (9%) and especially low for industrial technology programs at schools where both industrial technology and industrial arts degrees are offered (19%, See Table 1). If broken down the same way as Table 1, SJSU would report ratios of 3.2% (IT) and 0.4% (IA), respectively.

It is expected by this researcher that this ratio might be improved, that is, graduate enrollments increased, by instituting a Master of Science degree program to attract potential students. In addition, the national averages are only a minimum of what the Division would hope to attain. It should be a starting point, not an end point for a strong graduate program.

Statement of the Problem

Because San Jose State University's Division of Technology Master of Arts program enrollment is well below the national average, many potential graduate students are possibly not being served. This enrollment deficiency hinders the development of continued technical expertise, application of that technical expertise by potential students, and potential promotion of graduates (McLuckie & Sutton, 1986, p. 59). Therefore, a

needs assessment for an Industrial Studies Master of Science degree program at San Jose State was done.

In response to this perceived need, the Division of Technology proposes to develop a Master of Science degree program in Industrial Studies with two options for graduate study:

- an Industrial Technology program oriented toward the industrial technologist, manager, or supervisor who wishes to develop a greater depth and proficiency in an area of technical knowledge, industrial research skills, and skills in technical management.
- an Industrial and Technology Education program oriented toward educators who wish to further their understanding in their field of technical specialization, in research skills, and in teaching skills at any level- elementary, junior high, high school, or community college.

This research project was intended to determine, clarify, and characterize this need.

Purpose

It was the purpose of this research to conduct a survey of San Jose State University Industrial Studies Bachelors degree graduates and randomly selected Santa Clara Valley industries to determine the need for a Master of Science degree program in Industrial Studies. The survey was designed to solicit opinions and thoughts from former Bachelor of Science and Bachelor of Arts graduates of the Division of Technology as well as from the selected Santa Clara Valley industries. In addition, it was the purpose of this study to determine what course preparation is

recommended for an industrial technology graduate (at both the Baccalaureate and Masters degree level) to succeed in industry.

Research Questions

1. Is there a need for a Master of Science degree program in Industrial Studies at San Jose State University?
2. Would graduates with a Bachelor of Science in Industrial Technology or Industrial Arts prefer a Master of Science degree in Industrial Studies, or would they prefer an advanced degree in a different discipline (e.g. engineering, business, etc)?
3. What types of positions would graduates obtain after earning a Master of Science degree in Industrial Studies?
4. What graduate and undergraduate course work is recommended for an industrial technology graduate to succeed in industry?

Operational Definitions

The following terms were pertinent to this study and are defined to clarify their meaning with regard to usage in this study:

Concentration (emphasis) - An area of study within industrial technology departments in which students choose to specialize in areas such as computer electronics, graphic communications, packaging, or manufacturing.

Course - An ordered process or specific segment of instruction in an industrial technology or technology education program.

Curriculum - A series of educational experiences or set of courses offered to prepare the student for a profession or a skilled trade (Miller, 1973, p. 5).

Industrial Technology - An educational program designed to give the student an insight into how goods are produced, a knowledge of the problems of management and distribution, and the ethical foundation for making decisions (Weber, 1961, pp. 175-177).

Industrial Technology consists of degree programs of study designed to prepare management-oriented technical professionals (NAIT Accreditation Handbook, 1988).

Technology Education - A curriculum which has been designed to include the social, economic and political aspects of modern technology and which is aimed toward teaching of student technical literacy (Wright, 1981, p. 19).

Limitations / Delimitations

It was anticipated that the following factors, some of which were and some of which were not in the control of the researcher, could have influenced the research conducted:

Limitations

A. Some former students may have moved and might not be locatable.

B. The responses to the survey must be limited to the knowledge and/or expertise of the person that responds to the survey. Two questions were added to the industry survey to characterize this limitation.

Delimitations

A. The survey was sent to randomly selected Industrial Technology and Industrial Arts baccalaureate degree graduates since 1985 only.

B. The survey was sent only to randomly selected Santa Clara Valley industries listed in the *1988-89 Santa Clara Valley Business Guide*.

C. The survey samples included only 100 from each population listed above (Division of Technology graduates and Santa Clara Valley industries).

D. There was a period of one month from the initial mailing date in which respondents may have returned the survey. A remailing was then conducted in the hopes of increasing the return rate. Data obtained after that time was not included in the data analysis.

Significance

As a result of this research, San Jose State University's Division of Technology may better understand what type of Masters degree program prospective graduate students need and want. By addressing these issues the study will help the Division of Technology to design and implement a Masters level curriculum that will suit the needs of both graduates and industry.

A hidden aspect of the study is in advancing the philosophies and goals of the Division of Technology to those employers who are not familiar with this program at San Jose State University. Additionally, the results of

this study may be generalized as appropriate to other Industrial Technology programs across the country, and especially within California. The findings of the study might prove useful in providing educators and policymakers with important information to assist in the planning and design of educational programs that will effectively prepare industrial technology majors for future employment.

Chapter II - Review of the Literature

A review of the literature was conducted to determine the value of follow-up studies as a method of evaluating industrial technology. The literature revealed several studies that have been conducted and are relevant to this study.

Follow-up studies obtain information which assists in determining the extent to which the objectives of an educational system are being met (McKinney & Oglesby, 1971, p. 1). A follow-up study, usually in the form of a survey, provides many benefits in addition to data collection and analysis. A survey of former students may elicit responses to the educational program and to its success in preparing the student for employment. Furthermore, a survey of industrial employers might be conducted to determine the success of the educational program through the placement of its graduates.

According to Best (1970, pp. 134-135), a follow-up study may be used to evaluate individuals who have left an institution after completing a program or course of study. It may be utilized to determine what they are doing in their careers and what impact the institutions and programs have had on the graduates. Through an investigation of the graduate's status or opinions, the follow-up study may give the institution an idea of its successes in educating the graduate.

An acceptable method for judging the effectiveness of an institution's program is to determine the number of graduates who obtained jobs upon graduation, what percentage maintained their jobs, and whether the

program training was utilized in their employment (Clark, 1979, pp. 496-497). However, to be the most effective, the evaluation process should be continuous. Considerable information can be gleaned from graduates regarding the values they place on their educational training (Lambert, 1980, p. 20), thereby providing information for future curriculum planning and implementation. Since new technologies may be introduced to the university via its graduates, the follow-up study is imperative to assist in the development and implementation of current course offerings that are necessary for successful employment in industry.

Research by Miller (1973, p. 8) conducted in the Industrial Technology Department at Southeastern Louisiana University, was basically concerned with curriculum evaluation. The survey for that study was completed by 294 graduates representing a return rate of 88.4% in all curricular areas in the Department between 1956 and 1971. The following recommendations were based on the findings of the study:

- A periodic follow-up study of graduates should be undertaken to serve as a basis for curriculum evaluation and revision as a means for improving instruction;
- Because of the high concentration of departmental graduates in the area, a survey of local industries should be undertaken to determine what these industries require of graduates of the Industrial Technology Department at Southeastern Louisiana University; and,
- Additional course work in specific technical areas should be offered to provide greater depth in all curricula (Miller, 1973, pp. 107-108).

Owens (1973) conducted a follow-up survey of graduates of the Industrial and Technical Education Department at Louisiana State University. He found that a majority of industrial technology graduates entered fields related to industry and obtained initial employment in engineering-related positions (pp. 122-124).

Larimore (1976, p. 1) did a study of the Industrial Arts Education program at Tarleton State University. Of particular relevance to this study were findings that illustrated it is not uncommon for the Industrial Arts Education graduate to choose employment in industry and that those positions were most often in production. In addition, Larimore concluded that, once employed, the graduate felt meaningful curricular revisions to the Baccalaureate program were necessary.

In order to reflect the technological developments occurring in industry, according to Wieking (1979, p. 2), industrial education curricula and methodology must be continuously modified and updated. Unfortunately, considering the accelerating rate of technological change, this modifying process is never quick enough.

Research by Riddle (1974, p. 137) conducted at East Texas State University concluded:

- Additional laboratory courses at the graduate level which utilize modern industrial techniques and their application would be of value to those employed in industry and education;
- Updated physical facilities, equipment, and instructional media would benefit both the faculty and the students; and,

- Greater emphasis on public relations and continuous correspondence with former students of the Department would be beneficial.

Studies By The CSU System and Reactions To Them

A study conducted by the California State University Chancellor's office (Industrial Arts/Industrial Technology, 1969) was conducted in the late 1960's, and results indicated that industry perceived a definite need for baccalaureate-level programs in technology, but not masters degree programs. It was also determined that since industrial technology was such a young field, perhaps as societal pressures increased industrial needs would lead to a masters degree in the field. Therefore, the Board of Trustees adopted as policy at that time "that no masters degrees in technology should be authorized" (p.6).

"Industrial Arts, Industrial Technology, Engineering Technology: A Restudy" was completed by the CSU Chancellor's office in October, 1977. This study consisted of three comprehensive surveys of industry, community colleges, and Bachelor of Science Industrial Technology graduates. The findings concluded that:

- Responses from the community college survey revealed that the job market for Master of Science Industrial Technology graduates in that sector was insignificant.
- Responses from Bachelor of Science Industrial Technology graduates stated that they were interested in pursuing a masters degree, with the majority preferring it to be applied towards a Master of Science Industrial Technology.

- Industry was requested to rank five graduate degree objectives. The following rankings were made in order of preference: Master of Science Engineering, Master of Business Administration (MBA), Master of Science Industrial Technology, Master of Business Administration Industrial Technology, and lastly, Master of Arts Industrial Arts with a concentration in Industrial Technology.

Industry did not consider the Master of Arts Industrial Arts degree program a viable choice. The Restudy then concluded that since the Master of Arts Industrial Arts was the only other route, its effectiveness must be questioned. After analysis of the stated problem, the Committee felt that the results were not conclusive enough to justify the introduction of Master of Science Industrial Technology degree programs into the California State University system at that time.

In addition, the Committee felt it necessary to ask whether or not there existed a "generally recognized, consistent body of advanced work in the field of Industrial Technology" (p.4). One question that the Committee might have done well to address is: what constitutes a generally recognized consistent body of advanced work in the field of Industrial Technology? Although many different Industrial Technology programs exist across the nation, the goals as stated by the National Association of Industrial Technology, are "generally recognized" (See Chapter 1).

The Committee continued to conclude:

"It still appears that the system is offering about all of the Industrial Technology and related degree programs that can be sustained and turning out about all of the graduates that industry can reasonably absorb under existing and foreseeable economic conditions. One avenue of fruitful exploration for campuses offering Industrial Technology curricula is devising a schedule of course offerings which will better serve the needs of the more mature students holding technical jobs in nearby industries, if they are not fully tapping this resource" (p. 6).

In response to some of the Committee's conclusions, it should be noted that San Jose State currently schedules its Masters degree courses between the hours of 4:30pm and 10:30pm, since SJSU is aware that its students are often employed full-time and enroll in classes only part-time. What can be sustained in the CSU system and what industry can reasonably absorb under existing conditions have obviously changed tremendously since 1960 and 1977. Enrollment predictions for all CSU campuses continue to increase yearly. The enrollment of declared majors in the Division of Technology has increased tenfold since 1960 (then the Industrial Arts Department) and tripled since 1977 (the Industrial Studies Department) (S. Bates, personal communication, April, 1990). As far as proliferation of programs in the CSU system is concerned, there are currently no Master of Science degree programs in industrial technology or related fields (J. Erskine, personal communication, April, 1990). Also, industries in the Santa Clara Valley expand and multiply daily; therefore, positions for Master of Science degree graduates in this field would not be difficult to obtain considering the dynamic nature of Silicon Valley.

The Committee also concluded it was insufficient to justify a separate masters degree based on the advanced technical component alone.

Therefore, as the Committee felt, the MBA provides a ready-made, well-established, and accepted route. Currently, the MBA and the Master of Arts Industrial Arts or Master of Arts Industrial Studies as well as Engineering degree programs are the available choices for graduate study for Bachelor of Science Industrial Technology graduates of the California State University system.

Although a Master of Business Administration Industrial Technology concentration degree program does not exist, the advantages of the MBAIT program (See item 3, p. 16) were seen by the Committee to be:

- The MBA program is a nationally recognized and accepted professional degree.
- The cooperation between Schools of Business and Industrial Technology departments that characterizes the undergraduate program is extended to the graduate level.
- BSIT graduates by virtue of business courses taken, are generally qualified for admission to the MBA program. (To ensure clear status, the student may be advised to elect some additional business courses to complete the full "core"). This is the route many BSIT graduates (as well as BSET graduates) take now.

It should be noted here that the number of units required for the BSIT Business Management minor is 15 units. MBA programs generally require students from other undergraduate programs to complete a minimum of 30 units to fulfill the full "core" of undergraduate preparation.

The advantages of the MBAIT degree program as noted by the Committee are:

- Industrial Technology faculty will gain entry to graduate-level course work, will have control over the technical content, and will teach the courses for the concentration.

Currently, however, there is no MBAIT degree program offered in the CSU system (J. Erskine, personal communication, April, 1990). So it is unclear why the Committee's study discusses it at such length. Additionally one must question the development of an out-of-house graduate degree program for BSIT graduates. It would be more logical to expand the existing degree (BSIT) into a masters-level curriculum.

In any case, the same advantages could be held for the MS degree program in industrial technology or related fields. They are:

- The MSIT is a nationally recognized and accepted professional degree (Constitution and Bylaws, National Association of Industrial Technology, 1990).
- The cooperation between Schools of Business and Industrial Technology departments that characterizes the undergraduate program is extended to the graduate level; or, the requisite business content could be taught by qualified Industrial Technology faculty or a cooperation with Schools of Business could be developed whereby the courses are designed around areas in the field of Industrial Technology and taught by qualified faculty of the School of Business.
- BSIT graduates, by virtue of Industrial Technology courses taken, would be qualified for admission to the MS program. (To ensure clear status, BAIA students may be advised to elect some additional Industrial Technology courses to complete the full undergraduate preparation).

- Industrial Technology faculty will gain entry to graduate-level course work, will have control over the technical content, and will teach the courses for the concentration.

An additional advantage of the MBA- Industrial Technology concentration stated by the Committee is that the "MBA leads to a greater variety of higher level positions in business and industry, whereas the MSIT and similar degrees, which focus more on the production end, are limiting" (p. 7). This statement may have been true in 1960 or 1977 but it is impossible to credit today. There is no reason for the "production end" being limiting. One disadvantage of an MBA program is that it does not identify the unique strengths of a technically sophisticated industrial manager, as an MSIT program would. One possible reason for advocating an MBA is the high demand perceived for MBA programs in the seventies. The MBA was considered as the only avenue for one to move into the upper echelons of the business world. Today, universities in the United States produce over 70,000 MBAs, thus saturating the market (Cooper & Dowd, 1987, p. 82).

Summary

Through this review of literature, it was found that the follow-up study or survey of graduates and members of industry is a valid means of determining the success of an institution's degree programs. The program's graduates are strong indicators of the successes or failures of the program and can lend insight to the future direction of the degree program. In addition the review found that the California State University

Chancellor's office determined in 1960 and 1977 that the MBA provided a ready-made, well established degree choice for Bachelor of Science Industrial Technology graduates to pursue. However, the Committee's logic in reaching its findings is open to question.

Chapter III - Methodology

This study was designed to identify the need for a Master of Science degree program in Industrial Studies.

The procedure was:

- Review the literature;
- Develop the instrument;
- Validate and administer the instrument; and,
- Analyze the data.

Development of the Instrument

The literature review indicated that a mailed questionnaire is an appropriate instrument to acquire the information needed to determine the need for a Master of Science degree program in Industrial Studies. The questionnaire developed was authored by the researcher and pilot tested for validation with eight Master of Arts Industrial Studies students currently enrolled in the Division of Technology. In addition to mailing the survey to previous graduates, it was mailed in modified form to selected industries in the Santa Clara Valley. The modifications for the industry survey consisted mainly of changing the wording of the survey to reflect an employer's viewpoint. New items, but similar in style and purpose, were also added to the questionnaire, as were items of different style to fit the specific needs of the study (See Appendices A, C).

The questionnaire is organized in four sections as follows:

- Current status;
- Employer information;
- Undergraduate degree program; and,
- Interest in Masters degree programs.

The industry survey is organized in four sections as follows:

- Company information;
- Awareness of Industrial Technology degree programs;
- Preparation of Industrial Technology graduates; and,
- Requirements for Industrial Technology graduates.

The questions were answerable in one of the following ways:

- Check the category that best fits the respondent,
- Yes/no/no opinion, or
- Short answer.

The questionnaire was selected as an appropriate instrument for this study for the following reasons:

- San Jose State University's graduates from the Division of Technology are widely scattered throughout the Bay area.
- Santa Clara Valley industries would be able to respond, within a certain timeframe, at their convenience.
- The questions asked are important for a starting data base and are appropriate for a questionnaire.

Population

Through discussions with graduate faculty in the Division of Technology it was determined to limit the selection of graduates to those having completed their BSIT or BAIA degree since 1985 as these graduates would be the most likely to return for an advanced degree. The sample consisted of 100 previous graduates from that population randomly chosen from a list provided by the Office of Records at San Jose State University and 100 industries randomly chosen from the *1988-1989 Santa Clara Valley Business Guide*. The information gathered established the identity of the respondents, which included current status, degree type, and principal product of the company.

Administration of the Instrument

The questionnaire and a cover letter were mailed to the two sample groups. After four weeks, the return rate would have been deemed acceptable if it had exceeded 20%. Since 20% was not reached, a follow-up remailing was done in the hopes of increasing the response rate.

Analysis of Results

After all data were collected, the responses were organized and tabulated by question number. Since this was a descriptive study, analysis consisted of determining the total percentage of respondents for each item. Recommendations were then made based on these responses.

Chapter IV - Results

This chapter presents the tabulated results from the questionnaire to determine the need for a Master of Science degree program in Industrial Studies. After a four week period from mailing the response rate reached 17% for the graduate surveys and 3% for the industry surveys. A remailing was done to the two populations, allowing an additional two weeks to complete the questionnaires. The remailing increased the response rate to 33% for the graduate surveys and to 20% for the industry surveys. The responses and analysis for the graduate questionnaire are presented below. Similar information also follows for the industry questionnaire.

The data collected from the graduate survey reflected responses in several areas. Included were current status and employer information, undergraduate degree program, and interest in a masters degree program.

Current Status

The first section of the graduate follow-up questionnaire sought general information regarding current status and employer information. All of the 33 graduates who responded are employed. The respondents are employed with various types of companies, all of which are listed below:

Advertising and Graphic Design	Semiconductor Manufacturer
Rocket Motor Production	Software Companies
Goose Down Manufacturing	Missiles and Satellites
Integrated Circuits	Teleconferencing Equipment
Computer Company	Failure Analysis Engineering

Water Company
Military Contractor

Custom Cedar Home Manufacturer
Door Entry Lock Company

Following is a list of the job titles that the graduate survey respondents hold:

Sales Manager	Graphic Designer
Computer Operator	Failure Analysis Engineer
Customer Representative	Project Manufacturing Engineer
Reliability Engineer	Software Engineer
Quality Engineer	Satellite Operations Engineer
Packaging Engineer	Facilities Engineer
Technician	Purchasing Agent
Systems Engineer	Project Estimator
Components Engineering	Senior Technician

The titles of persons the graduates report directly to include: Plant Manager, Sales Manager, Computer Operations Manager, Director of Quality Assurance, Cell Leader, District Manager, Section Head, and President of the Company.

The positions or job titles identified as most commonly assigned to industrial technology graduates at respondents' places of employment include quality assurance engineer, laboratory technician, salesperson, production operator, graphic artist, purchasing agent, packaging and industrial engineering, product engineer, test engineer, customer representative, software developer, manufacturing engineer, planner, materials and processes engineer, electrical engineer, software specialist, junior engineer-technician, customer engineer, designer, laboratory

technician-specialist, reliability/maintainability/mechanical/safety engineer, and production supervisor.

Item 6 inquired whether the graduate's company financially supports graduate degree programs. Seventy percent (n=23) of the respondents stated that their company did financially support graduate degree programs and 30% (n=10) stated that they did not.

Fifty-two percent (n=17) of the respondents stated that their company provided flex-time for graduate students; 27% (n=9) did not and 21% (n=7) of the respondents expressed no opinion.

Item 8 questioned whether the graduate's company supported a graduate degree program, would they take advantage of it for a Masters degree in Industrial Studies? Under these conditions, 45% (n=15) of the respondents stated that they would take advantage of it for a masters degree in Industrial Studies; 34% (n=11) would not and 21% (n=7) indicated no opinion.

Of those for whom the company provided time off for classes, 45% of the respondents would take advantage of it for a Masters Degree in Industrial Studies; 34% would not and 21% stated no opinion (same as above numbers).

Eighty-five percent (n=28) of the respondents are not currently enrolled in a Masters degree program and 15% (n=5) are currently enrolled. Of the 15% (n=5) that were currently enrolled in a Masters degree program, three were enrolled at San Jose State University, one was enrolled at Santa Clara University, and one was enrolled at Golden Gate University. Additionally, three were enrolled in a Master of Business

Administration program, one was enrolled in a Master of Science Quality Assurance program, and one was enrolled in a Master of Arts Industrial Studies program.

Baccalaureate Degree

The second section inquired which baccalaureate degree was held by the respondents. Figure 1 gives an analysis of the distribution of the graduates by type of baccalaureate degree granted.

Figure 1- Type of Baccalaureate Degree

Figure 2 illustrates the distribution of the respondents by area of concentration within their baccalaureate degree program.

Figure 2- Area of Concentration Interest In Masters Degree

The final section helped determine the respondents' interest in masters degree programs, type of program, areas of specialization, and types of classes expected in a masters degree program in Industrial Studies.

Eighty-five percent (n=28) of the respondents were interested in obtaining a masters degree; 9% are not interested and 6% stated no opinion as shown in Figure 3.

Figure 3- Interested in a Masters Degree

Of those who are interested in obtaining a Masters degree (n=29), the type of degree program which would interest the graduates most are

displayed below: Degree Program	%	n
Master of Science Industrial Studies	31%	9
Master of Arts Industrial Studies	7%	2
Master of Science Quality Assurance	17%	5
Master of Business Administration	21%	6
Master of Science Engineering, Subfields:		
Computer Science	7%	2
Materials	7%	2
Electrical/Mechanical	7%	2
Undecided	3%	1

If the respondents (n=28) were to pursue a graduate program of study, the following time schedules would best fit their work schedules:

Full-time day	0%	Part-time: 8:00am-12:00 noon	3%
Full-time evening	3%	4:30pm-8:30pm	48%
Other	0%	6:30pm-10:30pm	46%

The semesters that would best fit the graduate's schedule (all that applied) include:

Fall semester (August-December)	73%
Winter Intersession (January)	24%
Spring Semester (January-May)	79%
Summer Intersession (May-June)	21%

Summer Semester (June-August)	9%
Special sessions (weekends, etc...)	27%

If the Industrial Studies masters degree program were to have technical areas of specialization, the graduates felt that the following would be most appropriate to their needs. The list below shows the percentages of respondents who checked each item (only those that applied were checked):

	Use now at work	Would like to develop
Management	15%	42%
Computer Electronics	33%	18%
Quality Assurance	27%	15%
Manufacturing	36%	9%
Power, Energy & Control	9%	6%
Design & Technical Drawing	18%	3%
Graphic Communications	3%	3%
Packaging	9%	0%
Other		
Recycling/ End Use	3%	Polymers 3%
Materials	3%	

The types of classes the graduates expect in the masters degree program in Industrial Studies are listed below: (* denotes those classes that were listed by more than one respondent)

* Materials Selection/Specification	Project Management
Quality Management	Individual Case Studies
Field Studies	* Manufacturing Processes
* Computer Programming	* System Design
* Practical Applications	Mechanical Engineering

* Composite Materials	Sensor Technology
Industrial Chemicals lab	* Management
Planning	Software
* Advanced Mathematics	Advanced Physics
* Communication Networks	Satellite Technology
Cost Accounting	Advanced Operating Systems
Master Scheduling	Aero/military Materials & Testing
* Materials Management	* Computer Integrated Manufacturing
Plastics	Advanced Statistics & Reliability
CAD/CAM/CAE	Facilities Design
Materials Requirement Planning II	* Robotics

The data collected from the industry questionnaire related to several areas of interest including company information, awareness of the Industrial Technology degree program at San Jose State University, recommended preparation of industrial technology graduates, and future requirements for industrial technology graduates. Following are the industry responses:

Company Information

Of the twenty industries responding, the company types include:

Integrated Circuit Manufacturing	Electron Tube Engineering
Missile Systems	Sputtering Sources
Military Track Vehicles	General Contractors
Electronics Testing	Image Communications
Semiconductor Manufacturing	Water Fabrication Equipment

Figure 4 indicates that the number of employees at these companies (n=20) vary.

Figure 4- Number of Employees at Companies

Seventy-five percent of the companies responding routinely track the degrees of hirees and 25% do not.

Awareness of Industrial Technology Degree Program at San Jose State University

Figure 5 illustrates the percentage of companies (n=20) who were aware of the Bachelor of Science Industrial Technology degree program at San Jose State University before receiving this survey.

Figure 5- Aware of BSIT Program at SJSU

Figure 6 illustrates the percentage of companies (n=20) that were aware of the Master of Arts Industrial Studies degree program at San Jose State University.

Figure 6- Aware of MAIS Degree Program at SJSU

Figure 7 illustrates the percentage of companies (n=20) that are aware of BSIT graduates presently working at the company.

Figure 7- Aware of BSIT Graduates at Company

Of those companies aware of Bachelor of Science Industrial Technology graduates presently working at the company, the number of BSIT's varied from 1 to 125 with some companies not knowing the exact number.

Item 6 inquired in what types of positions the respondent would see graduates who hold a Masters degree in Industrial Studies. Thirty-five percent (n=7) of the responding population chose not to answer this item. Twenty percent (n=4) did not know which types of positions the graduates would fill; and 5% (n=1) felt that they would fill no positions at their company.

Forty percent (n=8) of the respondents, however, felt that graduates of the Masters degree program in Industrial Studies would fill the following positions:

Manufacturing	Management
Engineering	Mechanical Design Groups
Technical Engineering	Product management
Production	Manufacturing Management
Operations Engineering	Safety Engineering
Reliability Engineering	Equipment Engineering

The positions or job titles industrial technology graduates generally filled at the companies include:

Production Supervisor	Senior Industrial Engineer
Production Control	Designer
Technical Illustrator	Associate Engineer
Mechanical Engineer	Special Projects Design Engineer
Technical Sales Engineer	Technical Associate
Industrial Engineer	Manufacturing Engineer
Support Engineer	Process Engineer
Quality Engineer	Technician
Safety Engineering	Reliability Engineering
Equipment Engineering	

Sixty-three percent (n=12) of the companies indicated that they recruit in terms of the following:

Hiring	Yes	No	No Opinion
4 year Industrial Technology	50%	25%	25%
4 year Industrial Arts	8.3%	58.3%	33.3%
Need Masters in Industrial Studies	8.3%	58.3%	33.3%
Need Masters in			
Mechanical Engineering	16%		
Electronics	16%		
Physics	16%		
Chemistry	16%		

Approximately eight percent (n=1) felt a Masters degree is not necessary for initial hiring with their company.

Recommended Preparation of Bachelor of Science Industrial Technology Graduates

With regard to the specific preparation a BSIT graduate should receive, the twelve companies that responded to this item felt that the following preparation is necessary (percentages are of the twelve that responded):

<u>Management</u>		<u>Technical</u>	
Production Control	92%	CIM	75%
Quality Control	83%	CAD	42%
Manufacturing Cost Analysis	92%	Electronics	75%
Supervision	75%	Computer Technology	50%
Facilities Planning	50%	Materials Testing	50%
Human Resource Mgt	50%	Packaging	25%

Accounting	33%	Manufacturing	83%
Marketing	25%	Design Drawing	33%
Other		Graphics	17%
Integrated Logistics	8.3%	Other	
Scheduling	8.3%	Mechanical Design Process	8.3%

Ten percent of the companies (n=2) felt that BSIT graduates should continue their education and obtain a masters degree in Industrial Studies; 70% (n=14) indicated no opinion regarding this item and 20% (n=4) felt that BSIT's should not continue their education and obtain a masters degree in Industrial Studies.

Of the companies responding, 40% know of employees currently completing a masters degree. The number enrolled in a masters degree program varies from 3 to 10 with some companies responding that they did not know the exact number.

Fifty-five (n=11) percent of the respondents stated that their company provided for flex-time for employees pursuing degrees. Thirty-five percent (n=7) of the companies do not and 10% (n=2) stated no opinion.

Figure 8 illustrates the percentages of companies that know of any employees interested in a Masters degree in Industrial Studies.

Figure 8- Percent knowing of Employees Interested in Masters Degree in Industrial Studies

The timeframe employees would most likely attend classes for a Masters degree:

- 60% part-time between 6:30pm-10:30pm
- 10% part-time between 4:30pm-8:30pm
- 10% other- 12:00 noon-5:00pm Fridays and one Saturday per month
- 10% full-time 6:30pm-10:30pm
- 5% part-time 4:30pm-8:30pm or 6:30pm-10:30pm
- 5% part-time 8:00am-12:00noon or 4:30pm-8:30pm or 6:30pm-10:30pm

The companies indicated the following masters degree types as being the most appropriate for industrial technology graduates working at their company:

Master of Science	50%
Master of Arts	0%
No Opinion	50%

The reasons given for the Master of Science degree program as the most appropriate degree choice for industrial technology graduates working at their company include: the assumption that the Master of Science degree is more

technically oriented; emphasis of a degree program must be on technical aspects of manufacturing; technical knowledge is most beneficial to their companies; and, companies are research and development oriented.

Future Requirements for Industrial Technology Graduates

Forty percent of the companies surveyed foresee changes in requirements for industrial technology graduates (either at the baccalaureate and/or masters degree level) in the next five years. The respondents collectively suggested several changes in requirements. The respondents indicated needs at the baccalaureate level for more hands-on training; robotics and workstation design skills; greater math skills; improved technical communications; more specific knowledge of manufacturing processes and increased emphasis on automated processes. At the masters level the respondents felt extensive study in a particular area and concentration on filling the communications gap between business managers and engineering would be necessary skills in the future.

Chapter V - Summary, Conclusions, and Recommendations

The purpose of this study was to determine the need for a Master of Science degree program in Industrial Studies at San Jose State University. This was accomplished by conducting two surveys, a graduate follow-up survey and a survey of Santa Clara Valley industries. Results of the survey were designed to aid in the determination of a Master of Science degree program in Industrial Studies. It is important however, to recognize the limitations of such a small sample size (33 graduates and 20 companies responding) in regards to the conclusions and recommendations of this study.

Summary

In preparation for this study, literature was reviewed which examined the questionnaire as a viable method for gathering data. The questionnaire was found to be an appropriate method of gathering data regarding the needs, strengths, and weaknesses of an educational program.

For an educational program to remain valid, it must provide meaningful learning and preparation experiences for its students. One method of program evaluation is through its graduates. The program can be evaluated through the graduates' ability to obtain and maintain employment upon completion of the educational program. The educational institution must be aware of the needs of its students and those of industry's

as well. Based upon the literature review process, the questionnaire was found to be an effective instrument in accomplishing evaluation tasks.

This study involved graduates who received either a Bachelor of Science Industrial Technology or a Bachelor of Arts Industrial Arts degree in the Division of Technology at San Jose State University after 1985. Industries surveyed were chosen randomly from the *1988-89 Santa Clara Valley Business Guide*.

Questionnaires were mailed to 100 graduates and 100 industries. Returns were received from 33 graduates and 20 industries. The first mailing resulted in a 17% response rate for graduates and a 3% rate for industry. A remailing was conducted after one month which increased the graduate response rate to 33% and the industry response rate to 20%.

The survey results indicate that 85% (n=28) of the graduates were interested in obtaining a masters degree. Thirty-two percent (n=9) of those are interested in a Master of Science Industrial Studies. These percentages contrast strongly with the 7% (n=2) interested in completing a Master of Arts Industrial Studies. The researcher asks "why, then, is the Master of Arts the only masters degree program in this field offered by the California State University System?" Traditionally, the Master of Arts degree program in Industrial Studies was instituted as an advanced degree for high school industrial arts teachers. Currently only 3 of the 30 Master of Arts Industrial Studies students have opted for the industrial education option in their degree program; the other 27 intend to work in industry. Even though 27 students plan to enter industry rather than teaching upon completion of their degree, the Master of Arts is the only degree option.

Of the respondents choosing to answer a similar question in the industry survey 50% stated no opinion. Of those that did have opinions (n=10), 100% felt the Master of Science degree to be the most appropriate. None of the industry respondents felt the Master of Arts degree was a viable choice.

The reasons industry gave for choosing the Master of Science degree dealt with the technical nature of the positions industrial technology graduates would fill at the companies (e.g., Mechanical Engineer, Industrial Engineer, Support Engineer, Quality Engineer, Designer, Technician, Production Supervisor, etc) Industry assumes the Master of Science degree is more technically oriented and will therefore be more beneficial to the company. Furthermore, it was suggested that a degree with emphasis on the technical aspects of manufacturing would be most beneficial.

In terms of hiring, the survey indicated that 50% (n=6) of the industries responding recruited Bachelor of Science Industrial Technology and only 8.3% (n=1) recruited Bachelor of Arts Industrial Arts graduates. The percentage differences might be due to the assumption that companies feel BAIAs traditionally enter education-related fields. Companies assume that the Master of Arts degree is designed only for teachers.

Fifty percent (n=16) of the responding graduates indicated that they would enroll in the masters degree program in Industrial Studies if their companies supported them financially and provided for flex-time.

If graduate respondents were to pursue a graduate program of study, 88% would prefer to attend part-time between the hours of 4:30pm-10:30pm.

Industry stated that employees would most likely attend classes part-time between 6:30pm-10:30pm and 50% (n=10) of the companies provide for flex-time for employees pursuing advanced degrees. Currently the Industrial Studies masters degree classes are held between 4:30pm-10:30pm; therefore, most prospective students and their companies would find the current schedule of classes convenient if employers did not provide time off for classes.

Industry was asked to state future anticipated requirements for industrial technology graduates (either at the baccalaureate or masters degree level). At the baccalaureate level, respondents listed more hands-on training, robotics and workstation design skills, greater math skills, improved technical communications, more specific knowledge of manufacturing processes, and increased emphasis on automated processes.

At the masters degree level comments were made regarding extensive study in a particular area and concentration on filling the communication gap between managers and engineering. Graduate respondents also indicated this same desire to develop skills in the seven areas of concentration, as are offered at the baccalaureate level.

Another point of interest is the lack of awareness of the masters degree program in Industrial Studies among survey respondents. Of those companies responding, only 35% (n=7) were aware of the program. Also, only 60% (n=12) were aware of the BSIT program.

Conclusions

From the analysis of the data collected from San Jose State University's Division of Technology graduates and Santa Clara Valley industries, and recognizing the limitations of such a small sample size, the results seem to indicate that with respect to the four research questions:

1. Thirty-one percent of graduate respondents are interested in completing a MSIS degree. Based on these data, and recognizing the limitations of the small sample size, somewhere between 9 and 31% of all IT graduates could be expected to pursue an MSIS were it to be offered. That is, yes, there is a need for such a program. Since the Division graduates about 120 baccalaureates per year, we could expect at least 11 students to enter the MSIS degree program per year. This compares strongly with the 3-4 students that enter the current MAIS degree program each year. That industry does not see this need so strongly is interesting and deserves more careful study.

2. Thirty-one percent of respondents would choose to pursue a Master of Science in Industrial Studies as opposed to other masters degree programs.

3. The types of positions graduates would obtain after completing a Master of Science degree in Industrial Studies are upper-level, technically-oriented (see page 35).

4. The graduate and undergraduate course work recommended for an industrial technology graduate to succeed in industry includes management and technically-oriented content (see page 36).

Additional Related Conclusions

1. Approximately one-quarter of the respondents might elect to continue their education for a Master of Science degree in Industrial Studies if their company provided financial support and provided flex-time.
2. The majority of industries surveyed do provide both financial support and time off for classes for graduate students.
3. The Master of Science degree is the most appropriate degree type for industrial technology graduates working in the Santa Clara Valley, according to survey respondents.
4. Many companies in the Santa Clara Valley recruit Bachelor of Science Industrial Technology graduates rather than Master of Arts Industrial Studies graduates.
5. The most convenient timeframe to offer classes in a masters degree program is between 4:30pm and 10:30pm, according to survey respondents.
6. Requirements for industrial technology graduates are foreseen to change in specific ways in the next five years.
7. Prospective graduate students are interested in technical specialization at the Masters level.

Recommendations

Based on the findings and conclusions of this study, it is recommended that:

1. The Division of Technology and the CSU Chancellors office consider the possibility of instituting a Master of Science degree program in Industrial Studies. The following supports this:

A. Of those industries indicating an opinion, all chose the Master of Science degree type as the most appropriate choice for industrial technology graduates working at their companies (Research Question 1).

B. Prospective students would be more likely to return for a MSIS rather than a MAIS (Research Questions 1 and 2).

C. Most Santa Clara Valley industries recruit BSIT graduates rather than BAIAAs and thus might hold the same predisposition with respect to MAs and MSs (Research Question 3).

D. According to the industries surveyed, employment positions for graduates of a Master of Science degree program in Industrial Studies would be upper-level, technically-oriented (Research Question 3)

2. The Division of Technology consider raising the standards of its degree programs to meet the anticipated change in requirements for industrial technology graduates in the next five years. This calls for continual curriculum review (Research Question 4).

3. The Division consider providing advanced technical content at the masters degree level in order to maintain technical competencies (Research Question 4).

Additional Recommendations

The following recommendations emerged from the survey results but do not specifically address the research questions. It is recommended that:

1. The Division of Technology consider the possibility of beginning a cooperative education or internship program at the masters degree level. One is currently in place at the baccalaureate, level and would only need some modification to satisfy the needs of graduate students. Companies might be more inclined to support a more organized and established program (coop or internship) rather than provide individual support.

2. The Division of Technology continue to hold graduate classes as they are currently, as the best and most convenient timeframe to attend classes for graduates and employees of the industries is between 4:30pm and 10:30pm. Also the Division should consider exploring other brackets within this six hour timeframe such as, 6:30pm-9:30pm.

3. The Division of Technology begin a public relations campaign to promote each of the Division's degree programs with local industries. The survey findings indicated that most industries were not aware of the program's existence before receiving this survey.

4. Additional research be conducted to determine what constitutes a generally recognized, consistent body of advanced work in the field of Industrial Technology.

5. Conduct a study to determine why industry does not see the need for a Master of Science in Industrial Studies as strongly as graduates of the Division of Technology.

6. A replication study with greater sampling be conducted to decrease the sampling error.

7. Additional research to determine the correlation of those who are familiar with industrial technology graduates or programs and those who recommend that BSITs continue their education for a Masters degree in Industrial Studies.

References

Industrial Arts/Industrial Technology. (1960). California State University Chancellor's Office, Division of Educational Programs and Resources. California State University.

Best, J.W. Kahn, J.V. (1989). Research in Education (6th Ed.). N.J.: Prentice Hall.

Clark, D.H. (1979). Job Related Measure of Educational Effectiveness. U.S. Educational Resources Information Center. (ERIC Document, ED 161 372).

Cooper, C. & Dowd, K. (April, 1987). Midlife crisis for the MBA. Management Today, p. 82.

Graduate Catalog, (1989-90). San Jose State University, San Jose, California.

Industrial Arts. Industrial Technology. Engineering Technology: A Restudy. (1977). Chancellor's Office, Division of Educational Programs and Resources. California State University.

Lambert, J.D. (1980). A Survey of East Texas State University Graduates in Industry and Technology From 1973-1979. Unpublished doctoral dissertation, East Texas State University.

Larimore, J.A. (1976). A Critical Analysis of the Industrial Arts Education Program at Tarleton State University. Unpublished doctoral dissertation, East Texas State University.

McKinney, F. & Oglesby, C. (1971). Developing and Conducting Follow-up Studies of Former Students. U.S. Educational Resource Information Center, ERIC Document ED 056 240.

McLuckie, J. & Sutton, J. (1986). Graduate education in industrial technology: programs and the future. A Global Influence. Proceedings of the National Association of Industrial Technology, Symposium IV. Ypsilanti, MI.

Miller, L. J. (1973). A Survey of the Curriculum for the Department of Industrial Technology at Southeast Louisiana University Based Upon Responses of the Graduates From 1965-1971. Unpublished doctoral dissertation, Southeast Louisiana University.

National Association of Industrial Technology Accreditation Handbook. Ypsilanti, MI 1988.

National Association of Industrial Technology Constitution and Bylaws. Ypsilanti, MI 1988.

Owens, J.R. (1973). A Follow-up Study of the Graduates of the Industrial and Technology Education Department at Louisiana State University. Unpublished doctoral dissertation, Louisiana State University.

Riddle, B.R. (1974). A Comparative Analysis of the Graduate Industry and Technology Programs at East Texas State University. Dissertation Abstracts International, 34: 5678-5679A

Santa Clara Valley Business Guide. (1988-89). Business Directories, Inc. Los Altos, CA.

Weber, E.M. (1961). A Comparative Study of Industrial Technology Programs in American Colleges and Universities with Industrial Arts Teacher Education and Technical Institute Programs. Unpublished doctoral dissertation, The Pennsylvania State University.

Wieking, R.H. (1979). The Development and Testing of a Model to Identify Technological Trends for Use in Industrial Education Curriculum Planning. Dissertation Abstracts International, 39: 4748A.

Wright, J.R. April, (1981). Technology education- what is it?
School Shop, 40, 19-20.

Bibliography

Suggested Related Readings

Andrews, W. & Miller, L. (1982). New technologies and implications for curriculum. Technology Education. Proceedings of the National Association of Industrial Technology, Symposium IV. Ypsilanti, MI.

Ary, D. (1985). Introduction to Research in Education (3rd Ed.). N.Y.: CBS College Publishing.

Kanigel, R. (1986). Technology as a liberal art: scenes from the classroom. Change, 18, p. 20-29.

Rosenbaum, B.L. (1986). Critical skills for successful technical professionals. Personnel, 63, p. 56-61.

Starkweather, K.N. (1987). Technology education: it's status and opportunities. Education Digest, 52, p. 36-40.

Appendices

Appendix A

Sample Graduate Cover Letter

A campus of The California State University

School of Applied Arts and Sciences • Division of Technology
One Washington Square • San Jose, California 95192-0061 • 408/924-3190

Dear Division of Technology Graduate,

The Division of Technology at San Jose State University is conducting a survey of the Santa Clara Valley business community. The survey is designed to provide the Division with information concerning current and future requirements of industrial technology graduates in the Santa Clara Valley.

In order for the survey to be a success, information must be obtained regarding the current and prospective needs of Industrial Studies graduates. Your cooperation in this survey is voluntary. The information you provide will be confidential and will be used for statistical purposes only.

Your cooperation in this survey will help the Division of Technology to provide students with the most relevant occupational programs based on current business information. As such, the graduates will be better prepared to embark upon careers in the Santa Clara Valley and elsewhere.

For the purposes of this study the following explanation of the Division of Technology and its degree programs is offered:

The Division of Technology at San Jose State University offers two undergraduate curricula, Industrial Technology and Industrial Arts. The curricula have as a common purpose the applied exploration of the industrial environment to prepare students for managerial positions in industry or to meet the requirements for the teaching profession in public schools or industry. The Division also offers a Master of Arts degree in Industrial Studies with two directions for graduate study: an industrial technology program and an industrial technical education program. The two graduate programs provide students with educational opportunities which will prepare them for leadership careers in industry and industrial education. In addition, the Division offers a Master of Science degree program in Quality Assurance which prepares students for leadership positions in quality assurance careers.

If you have any questions about this study, I will be happy to talk with you. I can be reached at (408) 378-1551. I hope that you will find the time to help us better understand and meet the needs of industrial studies graduates. If you would like a copy of results please enclose your business card or a letter when returning this survey.

Sincerely,

Lindia Gordon

Lindia Gordon,
Graduate Student

Appendix B

Sample Graduate Survey

If you are employed as an educator please answer questions according to your situation.

1. Your current status:

Employed ☐ Yes ☐ No

If no, please skip to Question # 9.
2. If yes, name and type of company currently employed _____
 Principal product _____
3. Job title: _____
4. Title of person you report directly to: _____

5. Please list positions or job titles most commonly assigned to industrial technology graduates at your place of employment: _____

6. Does your company financially support graduate degree programs?

☐ Yes ☐ No ☐ No Opinion
7. Does your company provide for flex-time for graduate students?

☐ Yes ☐ No ☐ No Opinion
8. If your company supported a graduate degree program, would you take advantage of it for a Masters degree in Industrial Studies?
 - a. If company financially supported? ☐ Yes ☐ No ☐ No Opinion
 - b. If company provided time off for classes? ☐ Yes ☐ No ☐ No Opinion
9. Are you currently enrolled in a graduate degree program? ☐ Yes ☐ No ☐ No Opinion
If no, please skip to Question #11.
- 10.a. University currently enrolled: _____
- b. Please state your degree objective: _____

11. Which baccalaureate degree do you hold?

Bachelor of Arts Industrial Arts ☐
 Bachelor of Science Industrial Technology ☐
 Other ☐

12. Which area of concentration (emphasis) ?

Quality Assurance ☐	Computer Electronics ☐
Design and Technical Drawing ☐	Packaging ☐
Graphic Communications ☐	Manufacturing ☐
Power Energy & Control ☐	Other _____

13. Would you be interested in obtaining a masters degree? ☐ Yes ☐ No ☐ No Opinion

If no, please be sure Questions 1-13 are complete and return this questionnaire in the envelope provided.

14. If yes, which of the following masters degree programs would interest you the most?

Master of Science Industrial Studies ☐
 Master of Arts Industrial Studies ☐
 Master of Science Quality Assurance ☐
 Master of Business Administration ☐
 Master of Science- Engineering ☐
 Identify which engineering discipline _____
 Other _____

15. If you were to pursue a graduate program of study which of the following time schedules best fit your schedule?

Full-time day ☐	Part-time: 8:00am-12:00noon ☐
Full-time evening ☐	4:30pm-8:30pm ☐
Other ☐	6:30pm-10:30pm ☐

16. Which semesters best fit your schedule? (Check all that apply)

Fall semester (August-December)	☐
Winter Intersession (January)	☐
Spring semester (January-May)	☐
Summer Intersession (May-June)	☐
Summer semester (June-August)	☐
Special sessions (weekends, etc...)	☐

17. If the Industrial Studies masters degree program had technical areas of specialization, which of the following would most appropriately fit your needs?

	Use now at work	Would like to develop
Quality Assurance	☐	☐
Computer Electronics	☐	☐
Design and Technical Drawing	☐	☐
Packaging	☐	☐
Graphic Communications	☐	☐
Manufacturing	☐	☐
Power Energy & Control	☐	☐
Management	☐	☐
Other _____	Other _____	

18. What types of classes would you expect in the Masters degree program in Industrial Studies? (Give Examples) _____

Thank you very much for taking the time to respond to this questionnaire. Your input will provide us with a source of direction in the development of our graduate degree program which is responsive to the needs of our students (graduates) and to business and industry. Please be sure to return this questionnaire before March 28, 1990.

As a prospective graduate student please provide a letter of support for a Master of Science degree program in Industrial Studies to:

San Jose State University
 Division of Technology - Attn: Graduate Advisor
 One Washington Square
 San Jose, CA 95192

Appendix C

Sample Industry Cover Letter

A campus of The California State University

School of Applied Arts and Sciences • Division of Technology
One Washington Square • San Jose, California 95192-0061 • 408/924-3190

Dear Employer,

The Division of Technology at San Jose State University is conducting a survey of the Santa Clara Valley business community. The survey is designed to provide the Division with information concerning current and future requirements of industrial technology graduates in the Santa Clara Valley.

In order for the survey to be a success, information must be obtained regarding the current and prospective needs of Santa Clara Valley employers. Your cooperation in this survey is voluntary. The information you or your company provides will be confidential and will be used for statistical purposes only.

Your cooperation in this survey will help the Division of Technology to provide students with the most relevant occupational programs based on current business information. As such, our graduates will be better prepared to embark upon careers in the Santa Clara Valley and elsewhere.

For the purposes of this study the following explanation of the Division of Technology and its degree programs is offered:

The Division of Technology at San Jose State University offers two undergraduate curricula, Industrial Technology and Industrial Arts. The curricula have as a common purpose the applied exploration of the industrial environment to prepare students for managerial positions in industry or to meet the requirements for the teaching profession in public schools or industry. The Division also offers a Master of Arts degree in Industrial Studies with two directions for graduate study: an industrial technology program and an industrial technical education program. The two graduate programs provide students with educational opportunities which will prepare them for leadership careers in industry and industrial education. In addition, the Division offers a Master of Science degree program in Quality Assurance which prepares students for leadership positions in quality assurance careers.

If you have any questions about this study, I will be happy to talk with you. I can be reached at (408) 378-1551. I hope that you will find the time to help us better understand and meet the needs of industrial studies graduates. If you would like a copy of results please enclose your business card or a letter when returning this survey.

Sincerely,

Lindia Gordon

Lindia Gordon,

Graduate Student

Appendix D

Sample Industry Survey

All responses will be kept confidential

1. Name and type of company employed with: _____
Principal Product: _____
2. Number of employees (approximate):
☐ 1-25 ☐ 26-100 ☐ 100-200 ☐ More than 200
3. Does this company routinely track university degrees of hires?
☐ Yes ☐ No ☐ No Opinion
- 4.a. Were you familiar with the Bachelor of Science degree in Industrial Technology?
☐ Yes ☐ No ☐ No Opinion
- b. Were you familiar with the Master of Arts degree program in Industrial Studies?
☐ Yes ☐ No ☐ No Opinion
- 5.a. Are you aware of any Bachelor of Science Industrial Technology graduates presently working at your company?
☐ Yes ☐ No ☐ No Opinion
- b. If yes, please estimate a number or percentage of total employees _____
If no, please skip to Question #9.
6. In what types of positions would you expect to see graduates who hold a Masters degree in Industrial Studies? _____

7. Which positions or job titles do industrial technology graduates generally fill at your company? _____

8. This company recruits in terms of the following: (Indicate as many that apply)

Hiring-

Four-year Industrial Technology graduates ☐ Yes ☐ No ☐ No Opinion
 Four-year Technical Education (Industrial Arts) graduates ☐ Yes ☐ No ☐ No Opinion
 Need a masters degree in Industrial Studies ☐ Yes ☐ No ☐ No Opinion
 Need a masters degree in _____

9. With regard to the specific preparation a Bachelor of Science Industrial Technology graduate should receive in a masters degree program, please place a check in the blank preceding each field below:

Program Preparation

MANAGEMENT

☐ Production Control
☐ Quality Control
☐ Manufacturing Cost Analysis
☐ Supervision
☐ Facilities Planning
☐ Human Resource Management
☐ Accounting
☐ Marketing
☐ Other _____

TECHNICAL

☐ Computer Integrated
 Manufacturing
☐ Computer Aided Design
☐ Electronics
☐ Computer Technology
☐ Materials Testing
☐ Packaging
☐ Manufacturing Processes
☐ Design Drawing
☐ Graphics
☐ Other _____

10. Industrial technology undergraduate majors should continue their education and obtain a masters degree in industrial studies? ☐ Yes ☐ No ☐ No Opinion

- 11.a. Are there any employees currently completing a masters degree?

☐ Yes ☐ No ☐ No Opinion

b. If yes, number currently enrolled _____

12. Does this company provide for flex-time for employees pursuing degrees?

☐ Yes ☐ No ☐ No Opinion

13.a. Do you know of any employees that are interested in seeking a masters degree in industrial studies? ☐ Yes ☐ No ☐ No Opinion

b. Which time frame would employees most likely attend classes?

Full-time day	☐	Part-time: 8:00am-12:00noon	☐
Full-time evening	☐	4:30pm-8:30pm	☐
Other	☐	6:30pm-10:30pm	☐

14a. Which of the following masters degree types would be most appropriate for industrial technology graduates working for your company?

☐ Master of Arts ☐ Master of Science ☐ No Opinion

b. Why? (Please explain) _____

15. Do you foresee any changes in requirements for industrial technology graduates (either at the Baccalaureate and/or the Masters degree level) in the next five years?

Baccalaureate:

Masters:

Thank you very much for taking the time to respond to this questionnaire. Your input will provide us with a source of direction in the development of our graduate degree program which is responsive to the needs of our students (graduates) and to business and industry. Please remember to return this questionnaire before March 28, 1990.

If in agreement with company policy, please provide a letter of support for a Master of Science degree in Industrial Studies to:

San Jose State University Division of Technology
 One Washington Square
 San Jose, CA 95192
 Attention: Graduate Advisor