Academic Program Review
Bachelor of Applied Science Degree in
Industrial Technology and Management
June 2008 – May 2009

<u>Panel Membership</u>

Chair

Andrew Purvis, Ph.D., Program Coordinator, Industrial Technology and Management

Program Review Panel

David Baker, Program Coordinator, Digital Animation and Game Design
Joseph J. Joyce, Instructor, Industrial Technology and Management
Mark Rusco, Associate Professor, Manufacturing Engineering

Associates

Don Mulder, Principal Partner, Balanced Enterprise Solutions, LLC
Tracy Powers, Assistant Dean, College of Professional and Technological Studies

FERRIS STATE UNIVERSITY
GRAND RAPIDS

August 15, 2009

College of
Professional &
Technological Studies

Douglas Haneline, Ph.D., Chair
Academic Program Review Council and
Professor of English
Ferris State University
Arts and Science Commons 3024
820 Campus Drive
Big Rapids, MI 49307

Dear Dr. Haneline:

On behalf of the Program Review Panel for the Industrial Technology and Management program of the College of Professional and Technological Studies, I am pleased to present to you the required report for the Academic Program Review process. The report contains information regarding the initial program review for this Grand Rapids-based program, and contains comprehensive information regarding the history, curriculum, perceptions, students, faculty and present status of the program. I that trust you and your colleagues in the Academic Program Review Council will find the report highly informative regarding this young, yet successful effort among the interdisciplinary program offerings from Ferris State University. This report outlines in detail the history of the program and offers elements regarding the many challenges as well as areas of strength of this program to ensure its overall viability. The document contains all information relevant to the review process, per the specifications outlined in the Academic Senate approved document "Academic Program Review: A Guide for Participants."

Since this is the initial APR report from the College of Professional and Technological Studies, I anticipate there will be a great deal of discussion among your colleagues in the APRC, along with the Academic Senate in November. The ultimate recommendation in this report is to continue the program, and we anticipate a number of questions and clarifications that may be required beyond the information contained in the report. The Program Review Panel welcomes further discussion on this recommendation, and sincerely hopes the APRC will carefully and deliberately consider this report, its information and its recommendations. Thank you for your continued outstanding service to Ferris State University and I look forward to additional discussions and meetings to discuss the content of the report.

Sincerely yours,

Andrew L. Purvis, Ph.D.
Chair, Program Review Panel,
and Program Coordinator,
Industrial Technology & Management

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TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

Criteria Summary for:
BAS Degree in Industrial Technology and Management

BAS Degree in Industrial Technology and Management

Established in 2002 as the first academic program of the College of Professional and Technological Studies in Grand Rapids, the Industrial Technology and Management Program offers a unique interdisciplinary degree program for nontraditional students with established employment experience. The program blends technology, manufacturing and business disciplines that results in a highly flexible degree-completion option for working adults. Graduates of the program typically enter the management realm of firms with a broad knowledge base, built on previous coursework at the associate's degree level for their chosen field of expertise.

The emphasis of the program lies primarily in decision-making, coupled with technical skills related to improving operations and efficiency of industrial firms. Problem solving skills and teamwork are two of the many areas of consistent emphasis in the sequence of professional courses. Specific areas of topical coverage include those in management of projects, capital outlay and investment, quality improvement, quality systems, and matters involving extensive supply chain networks. Graduates of the program are qualified not only to contribute to substantial improvements for their employers, but ready to take any one of several examinations for professional certification in specific fields to enhance their credentials and overall employability.

Entry into the program requires an associate's degree in a technical or business field, or at least 48 credit hours of prior course work in these disciplines. An overall grade point average of 2.5 is required in prior college courses. Graduates of the program must meet all Ferris general education requirements as outlined in the University catalog.

Why Choose Industrial Technology and Management?

The Industrial Technology and Management Program is designed to complement previous training in a technical area in order to move into a management role in a manufacturing or related facility. The degree program is interdisciplinary, bringing components of various programs together with specialty courses which expand the knowledge base of the student in manufacturing and industrial settings. The foundation courses provide depth of knowledge applicable to any technology field with classes in automation, globalization, lean manufacturing, OSHA safety, general management, quality statistics, and industrial operations. Students typically come to the ITM program with work experience in a manufacturing environment. This allows students to bring their own experiences from their jobs to the classroom for a unique perspective on solving manufacturing related problems. The program is offered currently during the evening hours in Grand Rapids and Warren.

The Industrial Technology and Management degree is designed for persons involved in any one of a number of areas in manufacturing who may possess many manufacturing or business-related credits or an associate degree, and who desire a bachelor's degree. This degree program will assist persons who want to make a career change with their current employer or a career transition to a new employer. It is designed to assist persons who desire to work in production supervision, sales engineering, production planning, quality, engineering supervision, and project management among other positions.

A significant part of the degree is an area called "Related Electives" where an individual can bring up to 48 credits into the degree which may include an associate degree. These credits should be from the area of manufacturing, however, appropriate business-related classes can be included. This area can be used to add a concentration of classes that represents an interest area of the student. For example, if a student feels a need for more study in the area of quality engineering, then the student may elect to complete the Ferris Quality Certificate Program. Another option to earn credits in the "Related Electives" category is to take an industrial competency exam(s) in an area of work specialization (e.g. manufacturing and tooling, technical drafting, tool and die, computer technology, etc.). Students choosing to take one or more industrial competency exams will receive prior learning credit based on their exam performance. Individuals taking these exams need five or more years of manufacturing or computer technology work experience.

Get a Great Job

Most of our current students work in a manufacturing facility and wish to advance their careers, responsibilities and salaries. By bringing a comprehensive understanding of the fundamentals of manufacturing, additional skills are learned in the program which can transfer directly to the workplace. Employment opportunities for Industrial Technology and

Management graduates are found across the entire spectrum of manufacturing and related industries. Common job titles one could expect from completing this program include production supervisor, project leader, team leader or in middle management. Depending on your previous experience, additional career tracks one could expect from obtaining this degree may also be available in engineering, upper management and sales.

- **UNIQUENESS AND VISIBILITY OF THE PROGRAM:**

  The program is similar to those offered at some institutions in the State of Michigan, but very unique in the degree flexibility in both required background of students and the off-campus locations where the program can be administered. The programs similar to this degree program are designed for place-bound students near the main campus of the various institutions. The program remains among the largest program of its kind in the State of Michigan. The overall visibility of the program has suffered, since the target population is not located in places of 'traditional' student recruitment, such as high schools or students enrolled currently at community college partners.

- **SERVICE TO STATE, NATION AND WORLD:**

  Graduates of the program remain in high demand despite the difficult economy and extensive troubles of the automotive manufacturing sector in the State of Michigan. All of the program graduates are employed in the State of Michigan, many at recognized multinational firms.

- **PROGRAM DEMAND:**

  The program has been near or above capacity since its inception, and interest in the program by prospective students remains very high. Inquiries about the program by prospective students are addressed at the rate of approximately four per week.

- **DEMAND FOR GRADUATES:**

  The demand for graduates remains high, but the recent economic difficulties could reduce the placement rate by an unknown amount.

- **PLACEMENT RATE AND AVERAGE SALARY OF GRADUATES:**

  The placement rate of graduates was reported at 87.5% within six months of graduation. The average salary of these graduates is $62,400 annually, among the highest of all programs at Ferris State University.

- **SERVICE TO NON-MAJORS:**

  The department delivers one single service course for other programs within the College of Professional and Technological Studies in Grand Rapids. Instruction is offered to approximately 15 students in two different departments per year.

- **QUALITY OF INSTRUCTION:**

  The quality of instruction as measured by surveys of students and graduates is high.

- **FACILITIES AND EQUIPMENT:**

  In Grand Rapids, the department shares classrooms and computer laboratory space with other programs. For other off-campus locations, the program is offered classroom space by the respective community college partner in that location. This arrangement has worked well for the past number of years and no dedicated space for the program is anticipated in the near future.

- **LIBRARY INFORMATION RESOURCES:**

  For off-campus students, resources are typically accessed through the various database and full-text service subscriptions. These resources have proved adequate at this time for the needs of the program.

FERRIS STATE UNIVERSITY
GRAND RAPIDS

Douglas Haneline, Ph.D.
Chair, Academic Program Review Council
ASC 3024
Ferris State University
Big Rapids, Michigan 49307

Dear Dr. Haneline,

Thanks to you and the APRC committee for your efforts in the review of our program in Industrial and Technological Studies. They are appreciated by the faculty and staff of the College of Professional and Technological Studies.

The compilation of this Academic Program Review Council report has involved the time and attention of several people. I wish to begin by acknowledging their fine work. My thanks goes to David Baker, Program Coordinator for Digital Animation and Game Design; Joseph J. Joyce, Instructor for Industrial Technology and Management; and Mark Rusco, Associate Professor for Manufacturing Engineering for their work on the Program Review Panel. I also wish to acknowledge Don Mulder, Advisory Committee Member and Program Review Associate and Tracy Powers, Assistant Dean of the College of Professional and Technological Studies for their careful review and edits. Special thanks go to Dr. Andy Purvis, Faculty Member and Program Coordinator for Industrial Technology and Management for his detailed analysis, recommendations and the authoring of this report.

The Industrial Technology and Management degree program serves Michigan's technical associate degree recipients with a broad degree providing theory and application in both business and engineering concepts. These broad discipline studies provide students the opportunity to move into sales, engineering technology or management positions.

In the early years of the ITM program, demand was high for the degree program. Much of this demand was based on a lack of opportunity for students to articulate their technical associate's degrees into business or engineering degrees. A second factor in the degree's early popularity was the manufacturing growth taking place in Michigan. While the first factor remains, the second, Michigan's manufacturing market, has deteriorated. In those early years of the program, CPTS and UCEL collaborated to export the degree to several community colleges across the state. The pace of growth was too fast as marketing structure was not coordinated, faculty resources were lean and there was little time for a carefully planned instructional format.

Through the careful analysis completed in the making of this report, several initiatives will be undertaken to improve the adaptability of curriculum, increase promotion to expand the identity of the program, and expand the distribution of the program through the application of instructional technologies. These changes are expected to make the program more relevant to Michigan's future economy and will result in increased enrollment.

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Concerning the adaptability of the ITM curriculum, at its inception the curriculum was created for a manufacturing market. Specifically, the curriculum focused on the automotive factory floor. With the economic changes taking place in our state, that focus is far too myopic. While the ITM program will still serve the manufacturing industries of Michigan, the fundamentals of engineering design and business management are applicable to many industries. We will provide additional concentrations serving new markets. Examples of these concentrations may include alternative energy, concrete technology, and sustainable manufacturing. A thorough study of Michigan's leading industries will be completed in the coming academic year. We expect this study to reveal other potential ITM concentration areas where FSU can serve the workers of our state.

Promotion of Industrial Technology and Management will increase but will also become more strategic. Our first promotional strategy will be outreach. Over the last year, CPTS has centralized the admissions function. This centralization has freed up employees at CPTS sites across Michigan to provide greater outreach for FSU degree programs. It is our intent to promote ITM to companies across Michigan and to reintroduce the degree program to students at a number of community colleges. Materials will be developed and staff will be trained so that the program is appropriately represented. A second promotional strategy will be advertising. New ads will be developed promoting the advantages of a bachelor's degree for employment, retention and promotion. We will seek to communicate our ability to retool unemployed workers from the manufacturing sector.

Finally, CPTS will begin to craft a network across Michigan of students who desire a degree in Industrial Technology and Management. I use the word "network" as CPTS faculty and administration will collaborate on a distance education model that provides the "hands-on" learning our ITM students are requesting while providing the convenience of online instruction. This student network will allow ITM to serve students spread across the state while keeping the program cost effective through section sizes approaching the course enrollment cap.

To summarize, ITM has had a history of rapid growth but has received little attention since its early accomplishments. The program is in need of curricular retooling, fresh promotion and clear methods of distribution. Over the next year CPTS will provide these services to make the Industrial Technology and Management program a preferred choice for technology focused students across Michigan.

I appreciate the investment made by the Academic Program Review Council. The faculty and staff of the College of Professional and Technological Studies look forward to recommendations which will serve Industrial Technology and Management's future growth.

Sincerely,

Donald J. Green

Donald J. Green, Ed.D.

SECTION 1: PROGRAM OVERVIEW

Program: **Industrial Technology and Management**

Degree: **Bachelor of Applied Science**

Department: **Industrial Technology and Management**

College: **Professional and Technological Studies**

MISSION

The Industrial Technology & Management Program will produce graduates, who within two years of graduation, are prepared with the depth of knowledge, breadth of experiences and an attitude of professionalism that will enable them to contribute in a supervisory role and/or managerial capacity within a manufacturing or industrial facility as described in the Objectives and Outcomes of the Program.

NARRATIVE TO SUPPORT THE MISSION

The College of Professional and Technological Studies of Ferris State University – Grand Rapids (CPTS) offers a four-year baccalaureate degree program designed to prepare technically competent individuals to succeed in the technical, managerial, sales and manufacturing-supervisory type positions. Additionally, the department supports the College, the University and the Community at large through the combination of academic activities, courses, certification opportunities and professional development activities.

The Industrial Technology and Management curriculum is built upon technical education at the associate's degree level, and includes breadth of mathematics, physical sciences, humanities and industrial relations, business administration, verbal and written communication skills, and specialized technology. Students of this program are primarily non-traditional students with extensive work experience in their primary field of expertise.

The primary mission of Industrial Technology and Management is to provide productive members for industry with skills to obtain technical, sales or supervisory positions. Its secondary missions are to support the missions of the other units of the College of Professional and Technological Studies and the University, to enhance and expand the knowledge in the various areas of industrial technology and to be of service to the public and the profession by sharing the expertise of its personnel.

The primary mission is accomplished by providing students with a strong background in the fundamentals of various technologies and improvement initiatives, by developing their abilities to reason and approach problems logically and methodically, by encouraging their creativity, and by cultivating strong verbal and written communication skills. A sound curriculum in tune with modern technology and society, and a high set of academic and ethical standards for both students and faculty are contributing to the educational service provided to students, the State of Michigan, and the nation.

A highly qualified faculty which constantly strives for excellence in teaching, and which is sensitive to the educational needs and capabilities of students, is essential to fulfill the department's primary mission. Quality instruction and scholarly activities of the faculty help to accomplish the secondary missions of the department and to enhance the teaching excellence and the determination of the educational needs of the students by interaction with the community and industry.

HISTORY

2001: Discussions began to develop an interdisciplinary degree program at the Grand Rapids Campus, centered on the broad topic of manufacturing, combined with elements of business in a flexible '3+1' curriculum model *(see note below)*

2001: Adjustments were made to the initial proposed program following consultations with officials from the College of Business and College of Technology

2002: A formal degree program proposal was submitted to the Board of Trustees

2003: Initial students enrolled in the program in Grand Rapids

2003: A cohort of students was enrolled in the program in Dearborn, through the marketing efforts of the University Center for Extended Learning

2004: A cohort of students was enrolled in the program in Muskegon, through the marketing efforts of the University Center for Extended Learning

2005: A full-time faculty member was hired to oversee and coordinate the program

2005: Additional cohorts of students were enrolled in the program in Lansing, and Warren

2005: The Advisory Panel was convened for the first time, giving the directives of developing a concrete skills-matrix for students and graduates of the program

2006: Additional cohorts of students were enrolled in the program in Port Huron and Midland (University Center)

2006: An eighth location for the program was announced for Auburn Hills, on the campus of Oakland Community College

2006: A proposal for adjustments in the curriculum was submitted and passed through the University Curriculum Committee

2006: A second full-time faculty member was hired to service students in the Southeast Michigan Region

2006: The first graduates of the program were awarded their degrees

2007: With guidance from the Advisory Panel the program outcomes were reworked from four vague statements to fourteen measurable items, intertwined with the curriculum

2008: In order to accommodate low enrollments at various off-campus sites, a directive from the Dean of CPTS necessitated the on-line delivery of approximately half the professional sequence courses in the program

2008: Due to low enrollments, cohorts at Auburn Hills, Dearborn, Lansing, Midland (University Center), Muskegon and Port Huron were phased out, affecting approximately 35 part-time and inactive students enrolled in the program

2008: The program becomes the first Grand Rapids based academic program to undergo the Academic Program Review process

Note: Proposals for the initial program approval process are furnished at the conclusion of this document in Appendices I and II. One draft document and one final approved document are included.

PROGRAM OVERVIEW

The Ferris State University catalog offers the following text regarding the Industrial Technology and Management Program (ITM):

Why Choose Industrial Technology and Management?

The Industrial Technology and Management Program is designed to complement previous training in a technical area in order to move into a management role in a manufacturing or related facility. The degree program is interdisciplinary, bringing components of various programs together with specialty courses which expand the knowledge base of the student in manufacturing and industrial settings. The foundation classes provide depth of knowledge applicable to any technology field with classes in automation, globalization, lean manufacturing, OSHA safety, general management, quality statistics, and industrial operations. Students typically come to the ITM program with work experience in a manufacturing or industrial environment. This allows students to bring their own experiences from their jobs to the classroom for a unique perspective on solving manufacturing related problems. The program is currently offered only during the evening hours at a variety of locations including Grand Rapids, Muskegon, Lansing, Warren, Dearborn, Midland/Bay City, Port Huron and Auburn Hills.

The Industrial Technology and Management degree is designed for persons involved in any one of a number of areas in manufacturing who may possess many manufacturing or business-related credits or an associate degree, and who desire a bachelor's degree. This degree program will assist persons who want to make a career change with their current employer or a career transition to a new employer. It is designed to assist persons who desire to work in production supervision, sales engineering, production planning, quality, engineering supervision, and project management among other positions.

A significant part of the degree is an area called "Related Electives" where an individual can bring up to 48 credits into the degree which may include an associate degree. These credits should be from the area of manufacturing, however, appropriate business-related classes can be included. This area can be used to add a concentration of classes that represents an interest area of the student. For example, if a student feels a need for more study in the area of Quality Engineering, then the student may elect to complete the Ferris Quality Certificate Program. Another option to earn credits in the "Related Electives" category is to take an industrial competency exam(s) in an area of work specialization (e.g. manufacturing and tooling, technical drafting, tool and die, computer technology, etc.). Students choosing to take one or more industrial competency exams will receive prior learning credit based on their exam performance. Individuals taking these exams need five or more years of manufacturing or computer technology work experience.

Get a Great Job

Most of our current students work in a manufacturing facility and wish to advance their careers, responsibilities and salaries. By bringing a comprehensive understanding of the fundamentals of manufacturing, additional skills are learned in the program which can transfer directly to the workplace. Employment opportunities for Industrial Technology and Management graduates are found across the entire spectrum of manufacturing and related industries. Common job titles one could expect from completing this program include production supervisor, project leader, team leader or in middle management. Depending on previous employment experience, additional career tracks one could expect from obtaining this degree may also be available in engineering, upper management and sales.

A. PROGRAM GOALS

The goals of the program can best be described with the objectives and outcomes of the program. These have been developed by program faculty members, with significant assistance from members of the Advisory Panel.

Program Objectives

1. Program graduates will demonstrate competence in not only the Core and Concentration requirements of the degree program, but also in the General Education and distribution requirements of Ferris State University.
2. Program graduates will have the opportunity to pursue their postgraduate studies in a variety of academic fields.
3. Candidates who graduate from the Industrial Technology and Management Program will have demonstrated the skills and knowledge necessary for pursuing a successful career in a variety of settings suited to their interests and prior experience in manufacturing or industrial settings or a professional business environment.
4. Program graduates will develop the skills, both technical and personal, that will allow them to communicate successfully in multicultural, global and rapidly changing external environments, which is sensitive to a broad range of societal concerns including ethical, environmental, political, and regulatory issues in making decisions.

Program Outcomes

Students in the ITM program will gain worthwhile experiences, not only in the classroom, but as a result of applying techniques and knowledge from the program within their professional and personal lives as highly technical professionals. Upon graduation from the ITM program with the requirements for a Bachelor of Applied Science met, graduates will demonstrate competency and will be prepared to:

1. Demonstrate competence and general knowledge by taking any one of a number of examinations for professional certification; including but not limited to: Industrial Technologist, administered by the National Association for Industrial Technology, Project Management Professional, administered by the Project Management Institute, Bronze Level Lean Certification, administered by the Society of Manufacturing Engineers;
2. Seek sources of credible reference and knowledge in order to apply the information in these sources to pertinent circumstances in their daily professional activities;
3. Solve problems and make decisions through thinking logically, critically, and creatively;

4. Improve quality in any operational system using one of a number of methods, including but not limited to: business process re-engineering, value stream management, six sigma, theory of constraints and statistical analyses;
5. Perform economic analyses to select alternatives for highest return or lowest cost;
6. Analyze production and administrative systems, machines/methods, and processes using fundamental technical principles and analyses and be able to improve the productivity of these operational systems;
7. Perform industrial systems analyses involving time and motion studies, and layout and material handling;
8. Be able to communicate effectively, clearly and precisely in both written and oral formats;
9. Demonstrate leadership and project management skills to lead subordinates and teams;
10. Explain and demonstrate the importance of teamwork in solving typical problems in a business or industrial environment;
11. Offer insight into theoretical and practical approaches to management and applying managerial knowledge within dynamic and competitive industrial environments;
12. Apply knowledge and skills in managing business internationally and analyzing complex economic, political, cultural and strategic issues involved in multinational enterprises;
13. Understand the necessity for personal growth, self-reflection, and assessment to engage in successful professional practice and development throughout their careers;
14. Recognize and explain the significance of being good citizens of this country and the world at large, and to be able to conduct themselves in a highly professional manner with their skills, work output, demeanor and conduct.

Program Goals Compared to College Goals

In terms of specific program goals, the faculty members of the program are working to ensure alignment of program goals with those of the College of Professional and Technological Studies. The following addresses each of the notable goals of CPTS and specific activities from ITM program faculty members as they pertain to those goals.

Enrollment Growth

The College of Professional and Technological Studies has a 'standing' goal of increasing enrollment, as extensive measures are often taken to enable this via marketing and promotional activities. Specific numeric goals have not been dictated by the CPTS

Administration, although it is understood that enrollment growth remains a high priority for all faculty and staff. The specific enrollment of the ITM program has not been steady, due in part to reasons to be addressed in subsequent sections of this document.

Enable Ferris State University to be the Option of Choice for Prospective Students

The nature of the ITM program allows place-bound students to pursue baccalaureate degree credentials in a field relevant to their previous experience and training. By offering the program at various community college locations in a part-time format, students are able to complete their degree requirements while retaining full-time employment. The ITM program is not unique in these respects compared to other program offerings from Ferris State University, but similar programs offered by competitor institutions have additional restrictions, prerequisite fields or courses, and more stringent residency requirements. In this manner, the ITM program fits well with the CPTS goals and framework to offer a degree completion option that is highly attractive to prospective students.

Delivery of Quality Academic Programs Congruent with the Ferris Mission

The ITM program is career focused, which aligns with the Ferris Mission quite well. Classroom topics offer case studies, problem solving and real-world situations to give students decision making tools in precisely the fields they expect to encounter in their positions. Classroom assignments and discussions often focus on issues, situations and problems students have experienced or are facing currently, and offer methodologies and steps to resolve a number of these matters. Program faculty members always seek continuous improvement in course offerings, topics, and methods to accomplish these tasks.

Goals Specific to the Program

The program faculty members have set a number of specific goals, and these are listed below.

Mid to Long Term Program Goals

A. Outcome number one (1) of the program indicates preparation for outside certification from a number of organizations. It is the desire of the program faculty and the CPTS

Administration to promote and encourage this from virtually all students in the program. It is not uncommon for certification examinations of this nature too often cost on the order of $500, and it is hoped to allow for a scholarship-like fund that pays the fees for all students wishing to pursue professional certification. It is hoped that promotional literature for the program can be developed which highlights this activity, in order to attract potential students to the program. Although a program scholarship fund has been established, it remains small and it is unknown whether the funds can be used for this purpose. It is anticipated that this matter will be addressed at the next meeting of the Advisory Panel in August of 2009.

B. The assessment plan of the program is in place, and continues to evolve. At present, formal assessment activities are taking place each semester – beginning with Spring 2009. A full implementation of the assessment plan will begin in the Fall of 2009, with the assessment of a planned set of specific outcomes for each and every semester. The assessment of all 14 program outcomes is expected to be completed every 18 months.

C. Based on assessment results, it is anticipated that adjustments will be made in the program. The overall plan will include extensive documentation in order to track changes, in addition to the items in place in the TracDAT system. It is also anticipated that the assessment results will be shared with members of the Advisory Panel, and extensive discussions will remain part of the agenda for each and every meeting of this group.

D. The existing job market is discouraging for both current students and potential students alike. This employment market will require continuous monitoring in order to determine whether or not the program will continue to meet the needs of its customers and students. Matters of significance regarding the employment market of program students and graduates will also remain part of the agenda for every Advisory Panel meeting for the foreseeable future.

E. Efforts for recruiting new students will be an ongoing process. As the program has gained momentum, it will become easier to highlight the success of program graduates. Their success will improve the reputation and visibility of the program in general, and it is anticipated this will become a part of marketing materials for the program. Continued communication with key personnel at community colleges and in certain industrial firms will continue, along with direct classroom visits to offer information about the program. At present the program faculty members have a standing goal of launching at least one cohort of new students each calendar year.

F. Following the Academic Program Review process, some curriculum changes are to be implemented in the program. These are based in part, to results of the APR survey, input from the Advisory Panel and student exit interviews. Coverage in regards to certain outcomes necessitates adding a dedicated course in managerial finance, and perhaps adjustment of other courses in the program. The course which deals with Computer Aided Design is targeted for potential elimination or inclusion into the community college prerequisites for the program at this time, although further discussion with both current students and the Advisory Panel is anticipated for this issue.

G. Input from the CPTS Administration indicates an interest in moving the program to more of a "Technology Management" emphasis, incorporating additional importance in topics such as intellectual property matters, innovation, energy consumption, sustainability and other emerging topics for broad-based technology management degree program.

H. Formal program accreditation is anticipated to begin once the Academic Program Review process is complete. The organization targeted at this time is the Association for Technology Management and Applied Engineering (ATMAE). The self-study documents required for the accreditation process are anticipated to be similar to the APR final report, and the extensive surveys required for this action have been completed as part of the APR process. A target goal for beginning the accreditation process is the Fall of 2010. Certain adjustments in the administrative structure of the program may be necessary before this can proceed forward, and these will be addressed in Section 3 of this document.

Program Compatibility, Role and Alignment with the Mission of Ferris State University

The Industrial Technology and Management Program aligns well with the Ferris Mission by providing relevant, career-focused education and training. Like many other programs at Ferris, it is a niche program unlike typical programs offered by peer and competitor institutions. The degree is unique in that it allows for degree completion from a variety of concentrations at the associate's degree level, thereby offering flexibility in both the background and experience of the prospective student. It is recognized that experienced professionals bring a wealth of knowledge to the classroom, and the program seeks to enhance that base of knowledge with coverage in areas beyond that of their area of primary expertise.

B. PROGRAM VISIBILITY AND DISTINCTIVENESS

The ITM program remains a unique offering both within the College of Professional and Technological Studies, as well as Ferris State University. Similar to a number of programs for nontraditional students within Ferris State University, its students bring a wealth of knowledge and experience to the classroom, which is indeed, unique at the undergraduate level. Each of these students shares their existing knowledge within their primary field of expertise to offer a breadth of topics and coverage. The program offers prospective students the opportunity to advance their credentials and enhance their careers, by allowing them to complete their undergraduate degree without extensive travel or residence on the Big Rapids campus of Ferris State University. The average student in the program enters with an Associate of Applied Science in one of any number of common technical or manufacturing related fields, including computer aided design, welding, electronics technology, industrial maintenance, plastics technology, machining and fabrication, materials technology and many other technical fields. Transfer credits from these programs are accepted into the flexible nature of the degree program, and the general concept is to respect the prior coursework, technical expertise and experience of the student, and build on these areas of prior knowledge with technical disciplines where they do not have direct knowledge or experience. Coupled with the extensive work experience of the student, the knowledge and skills gained while enrolled in the program allows the student to seek significant advancement opportunities or new employment positions related to their prior associate’s degree program, while having the advantage of a baccalaureate degree they seek.

The program was designed precisely for the working adult with five or more years of experience in an industrial or manufacturing setting. Until this program was initiated, there were limited options for prospective students wishing to pursue a baccalaureate degree without forfeiting numerous credit hours of their prior course work. An option considered by many of the students was likely the field of engineering; however, unless a student begins college course work in an established pre-engineering program, it is unlikely that a large fraction of the credit hours attained previously would transfer into an engineering program. As a result, prospective students would get easily discouraged and choose not to pursue the completion of a Bachelor’s degree program. The ITM program was initiated in order to give students another option that offers a shorter path than that of engineering, while covering a number of the same topics and concepts of the engineering discipline. The ITM program was not intended to replace an engineering degree program, for the field of engineering is prestigious and offers numerous career paths when completed. But when a student has 10 or more years of full time job experience, the prospects of pursuing a full engineering degree on a part time basis for eight (8) or more years is often daunting. The ITM program was designed with this in mind and offers prospective students another option to complete a degree program that is similar in many ways to engineering, and also has a notable emphasis in the business field. This niche remains unique within Ferris State University, as well as statewide, which will be addressed exclusively in Section 3 of this document.

For a prospective ITM student, the thought of being able to complete a bachelor's degree program, blended in both the engineering and business fields in less than four years, is very attractive. The professional sequence of courses offered by Ferris State University generally takes about two and one half years to complete when the student enrolls in an average of six credit hours per semester. The program was one of the first "3+1" programs offered by Ferris State University, allowing for a cost-effective degree program in a viable field of interest and experience for prospective students. In addition, by offering courses in the evenings, the student has been able to keep their current position, as well as have limited time for family obligations during this time. This "package" presented to the prospective student has generated a great deal of excitement among the target audience for the program.

With an attractive program to offer students, the ITM program is generally positioned well to attract students for enrollment. However, difficulties arise in trying to notify prospective students of this opportunity. The traditional transfer student population is enrolled at the community college level when considering transfer programs. The working adult that has been away from higher education for a long period of time is not generally 'available' in this manner. Despite this, career counselors at various community colleges have been invaluable in presenting the ITM degree program within the community college setting, but unless a potential student seeks this opportunity themselves, it remains difficult to reach the target audience of the program. Faculty members have also visited classrooms of community colleges to expose prospective students to the program; however this option remains viable only at those locations where policy allows such visits. Both full time faculty members are given release-time in order to aid in program promotion.

The program faculty and staff members within both CPTS and the former University Center for Extended Learning (UCEL) have made tireless efforts in marketing the ITM program. Mailings have been initiated and sent to hundreds of graduates of suitable feeder programs at the associate's degree level, along with the initiation of a number of promotional events at the various community college sites. In addition, CPTS and former UCEL personnel have held college fair events which promote various programs offered by Ferris State University, and these have been attended by program faculty members when teaching schedules do not conflict with the events. The promotional activities which have been undertaken by members of the program faculty for the review reporting period are displayed in Table I. In the case of the many promotional events, it remains challenging to coordinate the evening teaching assignments of faculty members and the events, and this has led to a lower visibility of the ITM program compared to many other CPTS and other off-campus programs represented at the occasion. With some success, faculty and staff members have visited manufacturing companies to inform personnel about the program opportunity, but often the Human Resources department has authority over similar matters within a large organization, and the promotional aspects of this may not reach the proper audience. Nonetheless, dedicated visits to select companies are expected to continue indefinitely in order to reach more people of the target program audience.

A series of Internet Web-pages were developed for the program in late 2006. These pages were resident on the Ferris State University – Grand Rapids server for a long period of time. These pages included general information concerning the program, program plans and checksheets, articulation guides for various community college sites, and an extensive segment of frequently asked questions. Many prospective students commented on the complete nature of the information available on this site. In March of 2008, the site was removed, in favor of an updated CPTS website, dictated by the administrative merger of CPTS and UCEL. The comprehensive pages in the former website were replaced with less comprehensive information about this and other programs based in Grand Rapids. The 'stripped' version of the CPTS website has remained for a number of months while the overall CPTS structure and duties of personnel have evolved. Updating the pages of all the programs remains in somewhat of a transition stage, as duties and responsibilities of CPTS personnel are adjusted and clarified. This was viewed as highly unfortunate and as a result, it was discovered that the volume of applications to the program decreased by a significant amount after the former website was removed. This general interest traffic and marketing method to attract attention to the program and students to the university is being addressed at present.

Rapid expansion of the program during 2005 and 2006 led to additional challenges. Applications for formal admission were processed solely in an on-line format, and selection of the program and its corresponding off-campus location was not updated in the on-line application web pages on a basis consistent with the target launch of various cohorts. This

Table I
Program Promotional Activity Assignments Involving Faculty Members of the Industrial Technology & Management Program at Ferris State University from 2005 – 2009

Date	*Location*	*Purpose/Event*
May 2005	Delta College	FSU Open House
July 2005	Shape Corp. – Grand Haven	Discussions for on-site program
Nov. 2005	Macomb Community College	FSU Open House
Dec. 2005	Grand Rapids Community Coll.	Classroom visit & presentation
Jan. 2006	Oakland Community College	Formal Signing – articulation
Mar. 2006	Macomb Community College	FSU Open House
April 2006	Grand Rapids Community Coll.	Classroom visit & presentation
Mar. 2006	St. Clair County Comm. Coll.	Faculty meeting & presentation
April 2006	Oakland Community College	Counselor's Presentation
April 2006	Lambton College (Sarnia, ON)	Faculty meeting & presentation
June 2006	Muskegon Community College	FSU Open House
Oct. 2006	Henry Ford Community College	Counselor's Presentation
Nov. 2006	Macomb Community College	Classroom visit & presentation
Nov. 2006	Grand Rapids Community Coll.	FSU Open House
Mar. 2007	Lansing Community College	Faculty meeting & presentation
Mar. 2007	Grand Rapids Community Coll.	FSU Open House
April 2007	Macomb Community College	Classroom visit & presentation
May 2007	Lansing Community College	College & Career Fair
May 2007	Grand Rapids Community Coll.	Dedicated program open house
June 2007	Gentex Corporation – Zeeland	College Fair Event
Oct. 2007	Lansing Community College	Faculty meeting & presentation
Oct. 2007	Grand Rapids Community Coll.	FSU Open House
Nov. 2007	Lansing Community College	Dedicated ITM program mini-fair
Nov. 2007	Grand Rapids Community Coll.	FSU Open House
Jan. 2008	Macomb Community College	Counselor's Presentation
Feb. 2008	Muskegon, MI	Presentation – West MI Manuf. Council
Mar. 2008	Grand Rapids Community Coll.	FSU Open House
Mar. 2008	Muskegon Community College	College & Career Fair
Mar. 2008	Delta College	Faculty & counselor's presentation
April 2008	Lansing Community College	Dedicated ITM program mini-fair
April 2008	Grand Rapids Community Coll.	Classroom visit & presentation
April 2008	Delta College	Dedicated ITM program mini-fair
April 2008	St. Clair County Comm. Coll.	Faculty & counselor's presentation
June 2008	Lansing Community College	College & Career Fair
June 2008	Muskegon Community College	Counselor meeting & presentation
July 2008	Oakland Community College	College & Career Fair
Nov. 2008	Grand Rapids Community Coll.	Faculty meeting & presentation
Dec. 2008	Macomb Community College	Classroom visit & presentation
Dec. 2008	Macomb Community College	Faculty & counselor's presentation
Feb. 2009	Macomb Community College	Classroom visit & presentation
Mar. 2009	Grand Rapids Community Coll.	FSU Open House
Mar. 2009	Macomb Community Coll.	Faculty meeting & presentation
April 2009	Lacks Industries – Cascade, MI	College Fair Event

led to a number of discrepancies in program and location selections, along with a number of students in the ‘undeclared’ status, often within the College of Technology (at present, Engineering Technology). Student records were often sent to incorrect locations on the Big Rapids campus, and it was difficult to track and have the ability to contact all students in a consistent fashion. In addition, the confidence of prospective students for ‘actually’ offering the program at their desired location was low and numerous prospects were lost as a result. As a result, a large number of prospective students chose other educational options, as the reputation of the program and Ferris State University suffered. At various off-campus locations, the number of enrolled students in the cohorts was often low at less than 10 students, including those at Port Huron and Delta College.

At present, the most successful method to attract potential students has been by word of mouth from current students. While at their place of employment, current students have often initiated conversations with their coworkers about their experiences, which have generated a great deal of interest in the program. However, for those companies which do not have existing students, it remains difficult to reach this audience, despite numerous marketing efforts. It is hoped that CPTS and Big Rapids campus marketing personnel will be able to assist the faculty members in promotion and marketing of the program in the future. To date, there has not been a comprehensive plan developed which addresses the many challenges of this specific program, or other programs which face similar challenges in program visibility. It is hoped this can be addressed with the assistance of CPTS marketing personnel in the next few months.

ITM Program Competitors

The ITM program is unique in that it is designed to serve working adults that have worthwhile employment experience in the industrial field, and are seeking promotional opportunities within their own technical field of expertise. Serving a nontraditional population such as this has challenges, but also allows for delivery flexibility in the Ferris model of serving off-campus students at the various sites of community college partners. After extensive review of academic programs that could be considered competitors, a number of institutions, their respective programs and some notable highlights of each are listed in Table II below.

Table II
Primary Competitors to the Industrial Technology and Management Program in the State of Michigan and Offered via the Internet

Institution	Degree	Program Name	Similarities	Differences
State of Michigan Programs				
Saginaw Valley State University	B.S.	Engineering Technology Management	- Evening courses for working adults	- Interdisciplinary program with no dedicated courses or faculty - Engineering course pre-requisites make for greater inflexibility - Place bound to the Saginaw area only
Michigan Technological University	B.S.	Industrial Technology	- Generous transfer credits	- Place bound to Houghton only - Electrical technology emphasis
Eastern Michigan University	B.S.	Technology Management	- Evening courses for working adults - Generous transfer credits	- Place bound to the Ypsilanti area only - Business Core is notable - Very little ‘technology’ emphasis
Online Degree Programs				
Siena Heights University	B.S.	Management		- Business only program
University of Phoenix	B.B.A.	Management		- Business only program
University of Wisconsin – Stout	B.S.	Management	- Technology Management concentration	- Business core and business emphasis
Illinois Institute of Technology	B.S.	Industrial Technology & Mgmt	- Very similar in many respects	- Curriculum is not as flexible - Far more ‘resident’ credit hours are required
Southeast Missouri State University	B.S.	Industrial Technology	- Content is similar	- Can attain degree with examinations or professional certificates without course enrollment
East Carolina University	B.S.	Industrial Technology	- Content is similar	- Curriculum is not as flexible - Far more ‘resident’ credit hours are required

For the Internet-only programs listed in Table II, the Bachelor of Business Administration (BBA) programs from University of Phoenix and Siena Heights University are listed primarily because they are strong options for prospective students, due to their convenience. The content of the ITM program is far more unique and offers additional technical emphasis from that of more common BBA programs. In addition, the target audience is far different for the ITM program than that of BBA programs across the state, region or nation. Because of this, not every BBA program will be listed as a competitor, but only these select few programs with a strong marketing presence in the state of Michigan are offered for comparison.

Given the job titles of current graduates of the ITM program, Ferris is well-positioned for continued success with this program. The specific job titles of program graduates will be addressed in greater detail in another section of this document. It is desired that the program remain viable for technical professionals and not abandon this in favor of more emphasis in the discipline of business. Having the technical component allows the program to remain distinct from the Bachelor of Business Administration program offered by the College of Business, with a different target audience and emphasis. It is anticipated that as long as resources are committed to the program, in the form of faculty, staff and other resources common to other academic programs, that the success of the ITM program will be ensured. The overall situation with enrollment trends, the needs of technical professionals and advice from the Advisory Panel and program graduates will be monitored closely over the next few years and adjusted appropriately to meet the changing needs of its students.

C. PROGRAM RELEVANCE

Labor Market Analysis

Information was obtained from the Federal Bureau of Labor Statistics in order to ascertain the anticipated demand from graduates in the program. The best fit for positions generally fell into specific titles; production manager, industrial engineering technician, industrial engineer, operations/general manager and engineering manager.[1-5] Currently, the employment market is not especially promising in the manufacturing sector, regardless of expertise. The data available at the time of this document was compiled from 2006, well before the severe turmoil experienced nationwide over the past 18 months. Nonetheless, it is anticipated that the figures presented are fairly accurate, but it is acknowledged that the figures may be optimistic. Concerning the 'engineering' title, it is noted that while formally trained engineers have more rigorous educational requirements, many students and graduates of the ITM program function as engineers. This is more common in smaller firms than larger firms, but nonetheless, this particular job title is worth noting in the labor market analysis of graduates in the ITM program. Within the available data for employment projections, some interpretation was necessary to determine a 'realistic' figure of positions that could be made available for graduates of the ITM program. Overall, it was estimated that approximately 0.5% of the "listed" positions nationwide would be available to graduates of the program, given the location of manufacturing firms within the State of Michigan in larger metropolitan areas.

A summary of the projections of the aforementioned job titles are presented in Table III. This data presents a composite total of projected employment figures from the Bureau of Labor Statistics. Specifically for the State of Michigan, projections on various jobs in 'high demand' are available from the Michigan Department of Labor and Economic Growth. [6] This information was compiled and published in October of 2008, and these fairly realistic figures show slight optimism for available positions within certain fields of expertise. Of noted interest are the positions of Industrial Engineer and General/Operations Manager. Projected into the year 2014, the overall demand for these two specific positions is expected to increase, allowing for up to 7,280 additional positions statewide. As mentioned previously, the final column of Table III presents the positions that could be considered "available" to graduates of the program in the upcoming years.

Table III
Employment Market Projections Nationwide and Within Michigan for Graduates of the Industrial Technology and Management Program

Occupational Title	SOC Code	Employment, 2006	Projected employment, 2016	Change, 2006-16		Available Jobs *
				Number	Percent	
Production Managers	11-3051	157,000	148,000	-9,000	-6	-45
Engineering Managers	11-9041	187,000	201,000	14,000	+7	70
General & Operations Mgrs	11-1021	1,720,000	1,746,000	26,000	+2	130
Industrial engineers	17-2112	201,000	242,000	41,000	+20	205
Engineers, all other	17-2199	170,000	180,000	9,400	+6	47
Industrial engineering technicians	17-3026	75,000	82,000	7,500	+10	37
Engineering technicians, except drafters, all other	17-3029	82,000	83,000	1,600	+2	8
				TOTAL *		452

* Note: This value represents an estimate of positions available within the State of Michigan in target regions for graduates of the program within each respective Occupational Title. The figure reflects approximately 0.5% of the total positions available nationwide.

Despite this unwelcome projection, it should be noted that many of the students in the program hold positions while they are completing their degree program. A substantial fraction of existing students already have the title of manager, and are looking for additional advancement opportunities. Overall, while employment projections are not positive in all respects, the labor market is not expected to 'absorb' all graduates of the program in new positions. It is generally accepted that manufacturing activity and corresponding employment is highly cyclical, and it is anticipated that the current poor job-outlook conditions will improve at some point in the future. Close contact with the Advisory Panel during this uncertain time period should enable adequate program adjustments so that demand for graduates remains constant and is positioned for growth in the future.

Response to Emerging Trends

The general flexibility in the specific requirements of the degree program allows for adjustment in areas of concentration, course sequences with targeted focus, and other modifications. Many of these have been and will continue to be discussed with the program

Advisory Panel as the discipline and conditions evolve. As an example, since these discussions began, Program outcomes have been adjusted to include additional formal professional certification. Enabling students and graduates to attain better credentials was viewed as highly beneficial and responsive in order to distinguish the program from those related or similar. It is anticipated that similar adjustments will continue in order to allow the program to remain current and relevant to the needs of students and employers alike.

The Choice of the Program for Prospective Students

As stated previously, the ITM program is a viable choice for prospective students for a number of reasons. While this issue was not addressed specifically in the surveys presented for the self-study, there are a number of common reasons students are drawn to the program, as is communicated in early advising sessions for prospective students. The specific reasons for students choosing the ITM program are as follows:

1. Students possess an associate's degree and wish to enhance their resume with baccalaureate level credentials
2. Students wish to position themselves for promotional opportunities within their current firm
3. Students understand the recent job market turmoil and wish to give themselves an advantage or similarly qualified persons
4. Students have been released from their positions in a downsizing effort and have no option but to complete their education for positions that are advertised within their expertise

In general, it is apparent that the program is, indeed meeting these goals, as evidenced by results from exit interviews, exit surveys and the various survey instruments developed for the APR process. The overall sentiment of the current students and program alumni are addressed in the question, "What is the likelihood you would enroll in this program again?" The results from this specific question in the survey indicate that 93% of the alumni and current students in the program would enroll in it again if given the opportunity. This result is favorable, but it is hoped that actions taken in the coming years will improve this figure.

D. PROGRAM VALUE

The primary benefit and value of the ITM program is to offer a degree completion program with a career advancement focus true to the mission of Ferris State University, and, as stated briefly, with the end result to expand opportunities for its students. The program has no dedicated specific facilities as these are either shared or off-campus, so in large part, the value of the program as it pertains to facilities is irrelevant. However, having a Ferris presence at community college sites increases the overall visibility of the institution and coupled with the program charge in a willingness to work with prospective students in their own region and within their own circumstances, results in expanding opportunities for students in terms of career advancement. No dollar amount has been assigned or attributed to the program or the University for this benefit.

The value to employers or potential employers for the ITM program is measured currently by the survey instruments developed for the APR process. Specifically, questions in the survey relate to specific outcomes of the program compared to the needs of employers of graduates. Since this is a young program, the results have only been compiled recently, but analysis and appropriate program adjustments are anticipated to result from this ongoing process. From exit surveys performed from 2006 and 2007, results showed a very favorable perception of the skills of program graduates. These matters will be addressed in greater detail in Sections 2-B and 2-C of this document. One final matter involving employers is that of the Senior Capstone Projects undertaken by students. In these projects, students take on the role of a consultant to solve complex problems, often at the place of their employment, to result in substantial savings and facility improvements. This matter will be addressed in greater detail in the upcoming section on 'Outside Service' for program faculty members.

Scholarly Activities Undertaken by Program Faculty Members

The program faculty members have made an effort to engage in a variety of activities of a scholarly nature, time permitting. The majority of these activities are considered part of the 'Professional Service' component of the typical load of university faculty members. In the case of conference activities or enhancement of the credentials of a faculty member, these items would be classified under the 'Professional Development' component of the typical activities of faculty members. Additional details on the manner in which all faculty duties and activities have been allocated will be addressed in Section 3 of this document. A summary of all activities undertaken by faculty members over the past four years is offered in Table IV. The potential benefit to the program or the university with each respective activity is also listed.

Table IV
A Summary of Scholarly Activities Undertaken by Faculty Members of the Industrial Technology and Management Program at Ferris State University from 2005 – 2009

Date	*Faculty Member*	*Activity*	*Benefit*
Nov. 2005	Andrew Purvis	Grant Proposal written and submitted – Society of Manufacturing Engineers	Program and University visibility; faculty credibility
Feb. 2006	Andrew Purvis	Conference – Great Lakes Process Technology, bi-annual meeting - Midland, Michigan	Program and University visibility; discuss emerging trends for program
Nov. 2006	Andrew Purvis	Peer Reviewer – conference papers; American Society of Mechanical Engineers, IGTI-Turbo Expo 2007	Program and University visibility; faculty credibility
Jan. 2007	Andrew Purvis	Peer Reviewer – conference papers; American Vacuum Society (ICMCTF 2007)	Program and University visibility; faculty credibility
March 2007	Sean Goffnett	National Conference – American Society for Quality; CQE Examination administered and passed	Program and University visibility; faculty credibility
June 2007	Andrew Purvis	Conference – presented paper & chaired technical session; ICoSM-2007, Penang, Malaysia	Program and University visibility; faculty credibility
Sept. 2007	Andrew Purvis	Local Chapter Meeting – Society of Manufacturing Engineers	Program and University visibility; discuss emerging trends for program
Sept. 2007	Andrew Purvis	U.S. Patent Awarded – 7,273,635	Program and University visibility; faculty credibility
Nov. 2007	Andrew Purvis	Peer Reviewer – conference papers; ASME: IGTI-Turbo Expo 2008	Program and University visibility; faculty credibility
Dec. 2007	Sean Goffnett	Completed and defended Ph.D. Dissertation – Eastern Michigan University	Faculty credibility
Jan. 2008	Andrew Purvis	Peer Reviewer – conference papers; American Vacuum Society (ICMCTF 2008)	Program and University visibility; faculty credibility
Feb. 2008	Andrew Purvis	Local Chapter Meeting – Society of Manufacturing Engineers	Program and University visibility; discuss emerging trends for program
Mar. 2008	Andrew Purvis	Elected to Editorial Board – International Journal of Engineering Research and Technology	Program and University visibility; faculty credibility
April 2008	Andrew Purvis	Conference – attendee; Building a Green Future – Grand Rapids	Program and University visibility; discuss emerging trends for program
Jan. 2009	Andrew Purvis	Peer Reviewer – conference papers; ASME: IGTI-Turbo Expo 2009	Program and University visibility; faculty credibility
Feb. 2009	Andrew Purvis	Training Course and Subsequent Examination: Bronze-Level Lean Certification (SME)	Program and University visibility; faculty and program credibility
April 2009	Andrew Purvis	Conference – attendee; Building a Green Future – Grand Rapids	Program and University visibility; discuss emerging trends for program
May 2009	Joseph Joyce	Conference – attendee; "Scholarship of Teaching and Learning" – Eastern Michigan University	Program and University visibility; discuss emerging trends for program

University and College Service by Program Faculty Members

Program faculty members have been very active in assignments in service to Ferris State University as well as the College of Professional and Technological Studies. Table V displays a summary of the assignments and activities given to the program coordinator for the reporting period, from 2005 through 2009. The majority of these activities have been assigned, but there are numerous activities that have been undertaken voluntarily. It is anticipated that service such as those listed will continue in order to enhance the credibility of the program and its faculty.

Table V
Activity assignments from 2005 – 2009 by faculty members of the Industrial Technology & Management Program regarding direct service to Ferris State University and the College of Professional & Technological Studies

Date(s)	*Activity*
Sept. 2005 - present	Academic Senate
Sept. 2005 – present	University Curriculum Committee
Mar. – May 2006	Search Committee – ITM Faculty
April – May 2006	Participant – GR - Admissions Officer Search
June – July 2007	Search Committee – CPTS Asst. Dean Secretary
Aug. – Sept. 2007	Search Committee – DMSE Faculty
Aug. 2008 – present	CPTS Curriculum Committee (Chair)
July – Sept. 2008	Search Committee – ITM Faculty
March 2009	VP for Admin. & Finance Candidate – presentations
April 2009	FSU Faculty Discussions – NSSE Data Perceptions

Outside Service by Program Faculty Members

There have been cases of public and professional service by faculty members as time allows. These items are also considered part of the 'Professional Service' component of the common load of university faculty members. These activities are summarized in subsequent paragraphs.

Senior Project Capstone

Students in the program are required to complete a Capstone course, where an extensive project is undertaken in order to demonstrate the breadth and depth of knowledge and skills the student has acquired in program courses. Typically, a student will undertake an effort associated with the current position with their employer as a 'client' of the project. These projects involve real problems in facilities and organizations that the student solves during the course of the semester-long effort. Among the common topics of projects are improvements in efficiency, cost savings, matters involving facility layout, improving manufacturing systems, sales opportunities and others. In the case where a student may not have a position suitable to execute a project, the program faculty have found outside client companies willing to offer project efforts to these students.

For each project, the student must set tangible goals, analyze the problem and implement solutions for the effort. Collectively, these projects have resulted in substantial benefits to the employers of the students. It is commonplace for a well executed project to offer a total value to the client of well over $100,000. For a large section of nearly 20 students for a Senior Project Capstone course, the total value in terms of savings, improved efficiencies, reduction in waste or increased sales opportunities could exceed a figure on the order of $1 Million per semester. A conservative estimate for all collective cost savings and overall value added to the client sponsors of the projects for students in the program over the past four years would be well over $2.5 Million. While these figures are difficult to track, each and every project undertaken often results in substantial benefits for both students and their employers. It is important to note that while the benefits to clients of senior capstone projects have been substantial, the faculty does not stress any specific dollar amount for any given project. The importance of enabling each student to execute the methodology of problem solving and take the correct steps in each effort is what is emphasized during the course requirements. Examples of two (2) recent final reports from the Senior Project Capstone course are available in the Appendix portion of this document for perusal and reference in order to demonstrate the depth and quality of these efforts.

FIRST Robotics

Beginning in March of 2006, Dr. Andrew Purvis accepted an invitation to represent Ferris State University as a Judge for the FIRST Robotics West Michigan Regional Competition held at Grand Valley State University. The FIRST organization has been instrumental in developing a series of activities to generate interest in the fields of science and technology for young students. The FIRST Robotics Competition allows high school student teams to design, build and compete in a structured game format with other students, while learning about technology and science disciplines. From its beginnings in 1989, the FIRST organization now has a substantial world-wide presence, and has enabled the exposure of thousands of young people to the fields of science, technology and engineering. The judges of this competition assess various aspects of the ultimate product from the students and give awards based on specific criteria of the competition, robot design and function and other areas related to the business aspects of the team. It is stressed that the judges in this competition should serve as role models for the students, in order that they can envision an exciting future for themselves in fields related to science or technology. The participation of Dr. Purvis in this event has continued since 2006, and recently he completed his fourth consecutive year on the Judge's Panel for the West Michigan event. In addition, he was invited to serve on the Judge's Panel at the FIRST National Championship event in Atlanta, Georgia. Unfortunately, time commitments and prior obligations prevented his appearance at this event in April of 2009. Mr. Joseph Joyce, the second full time member of the ITM faculty, joined Dr. Purvis in March of 2009 on the Judge's Panel at the West Michigan event, and hopes to continue the association with FIRST in one of the many Southeast Michigan FIRST events beginning in 2010.

Course Activities: APPS 301 – Project Management

In one of the building block courses of the program, APPS 301, the program coordinator has initiated a major assignment where students will undertake and execute actual projects during the course of the semester. Since the business and industrial sectors typically execute projects in a team setting, exposing the students to teamwork is an essential element of both the course and its overall goals. One of these executed projects was to develop a self-directed student orientation for off-campus students. The faculty felt strongly that having this information from the perspective of a student was very relevant and important, so the assignment has been given to students. Other assigned projects have involved developing Internet web-pages for the various academic departments in Grand Rapids. In each subsequent semester, it is the intent that these items can be expanded and refined until a finished project is available. Other assigned projects have involved outside clients, with goals and expectations within the timeframe of the semester. One specific instance was to investigate the feasibility of on-site power generation using a large volume waste water stream at a food processing facility. In this structure, Ferris State University has benefited, along with students, and even outside clients for these collective efforts as part of the program. It is anticipated these assigned projects will continue, as the specific Project Management course is offered typically once per academic year.

Physics Day at Michigan's Adventure

In May of 2006, Dr. Purvis spearheaded an effort to organize a team of students, faculty and staff members for an appearance at the annual 'Physics Day' at Michigan's Adventure Amusement Park in Muskegon, Michigan. The concept of this event is to generate interest in high school and middle school students within fields such as science and engineering, while offering activities throughout the day related to first principles with regard to amusement park rides. The team from Ferris State University included students and faculty from the Digital Animation and Game Design program as well as CPTS marketing personnel, where simulations were offered for roller coasters and discussions with participants allowed for program recruiting and general interest in Ferris State University academic programs.

Future Service Efforts

It is hoped that the program faculty members will have the opportunity to devote time to activities such as those described above for scholarly activities and outside service activities in upcoming years. Both full time faculty members in the program feel that engagement in various activities will offer enrichment to both the position as a faculty member, and enhancement of academic programs through the involvement with current emerging trends. In addition, as students in the program graduate, these alumni will also have the capacity to offer capstone projects to more students that have this need, as well as consulting opportunities for faculty members.

E. REFERENCES

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SECTION 2: PROGRAM PERCEPTIONS

A. Program Alumni

The Program Review Panel administered a survey for alumni of the program in order to gather information concerning the perspectives of graduates for the purposes of this assessment report. A full copy of the survey instrument is offered on subsequent pages of this portion of the report, along with the complete results, compiled by the Office of Institutional Research and Testing. The report was developed and subsequently refined by the Program Review Panel, and delivered via email to graduates of the program in February 2009. A total of 45 surveys were delivered to program alumni, and 17 responses were received, a response rate of 37.7%. The actual survey is offered for perusal beginning on Page 2-6. While the response rate for the survey was lower than anticipated, it is acknowledged that a number of factors have contributed to this aspect of the overall self-study process. Among these are the large degree of apprehension among those in the workforce, priorities in both job and home-life responsibilities, and the discouraging news in the general economy. All of these factors and likely many others have contributed to fewer completed surveys from alumni.

The purpose of the survey was to give a relative gauge of effectiveness of the program, as perceived by the graduates of the program. The intent was to give the opportunity for feedback in terms of the program outcomes, as well as other informal measures of program strengths and weaknesses. The question format was delivered in order to enable minimal inconvenience for each respondent, and the initial goal was to deliver a survey that required from 5-10 minutes for completion. The specific format and content of questions is displayed in the actual survey instrument, beginning on Page 2-6. The vast majority of questions used a 4-point Likert scale, with the intent of obtaining responses which indicate 'favorable' or 'unfavorable' from the respondent, with varying degrees of each respective response embedded in each question. The instrument afforded alumni the opportunity to give direct feedback to the program faculty and Program Review Panel for the purpose of overall program assessment. Since the ITM program is under its first APR cycle, no previous data is available for comparison. In hindsight, it was determined that the scale used for evaluation was not as discriminating as desired. As a consequence to this, in future surveys, rather than using a 4-point Likert scale, perhaps a 7-point scale would offer better overall variability in the responses, so that a more clear indication of strengths and weaknesses in the program could be obtained.

In general, it appears as though perceptions of the program from graduates are highly positive. The program offered its first degrees in 2006, so the history of the program cannot be compared to that of previous years. Prior to offering the complete results, some notable highlights are offered below.

Graduate Satisfaction

A wide variety of questions were asked in the survey, but perhaps the most direct questions dealing with program quality are listed in Table VI below. Indicated are four questions and the summary of responses for graduates that gave a favorable rating. In this and in all subsequent cases, answers which contained 'Strongly Agree' or 'Somewhat Agree' are shown as favorable. The results indicate broad satisfaction from graduates of the program. Additional comments can be reviewed from the complete results offered on subsequent pages of this section.

Table VI
Summary of Direct Questions of Quality from Alumni
Of the Industrial Technology and Management Program
Obtained from Surveys Delivered early in 2009

Question No.	Question Related to Program Quality	Percentage of Favorable Responses
5	I perform as well or better than my peers	80.0%
9	The Overall Expertise and Value of Instructors in the Program was 'good' or better	92.3%
12	I would enroll in this program again if given the opportunity	94.1%
13	Did you obtain a relevant full-time position within 6 months of graduation?	87.5%

Outcomes Assessment

The program outcomes were surveyed in two ways; first, it was asked whether the respondent attained adequate knowledge or skills in the specific area, and second, whether this particular skill is necessary in the current position of the respondent. A summary of these results is displayed in Figure 1. The responses are highly favorable concerning whether the respondent was able to attain the necessary level of knowledge of skill in each sub-discipline which is related directly to specific outcomes. Perhaps the only areas of concern in this information as presented relate to Outcome numbers 1 and 12, Professional Certification, and Global Perspectives, respectively. In the case of Professional Certification, less than 80% of the respondents indicated this was necessary or needed in their current position. A comment on this matter is that this specific outcome is not familiar to the entire program population, as assessment and outcomes are somewhat in their infant phases in this particular program. Outcome number 1 has not been communicated to program alumni to a large degree, and it is acknowledged that it will take some time to allow all fourteen program outcomes to become familiar to students and alumni alike. All outcomes are to be incorporated into promotional literature in the near future, but to date, this has not been performed.

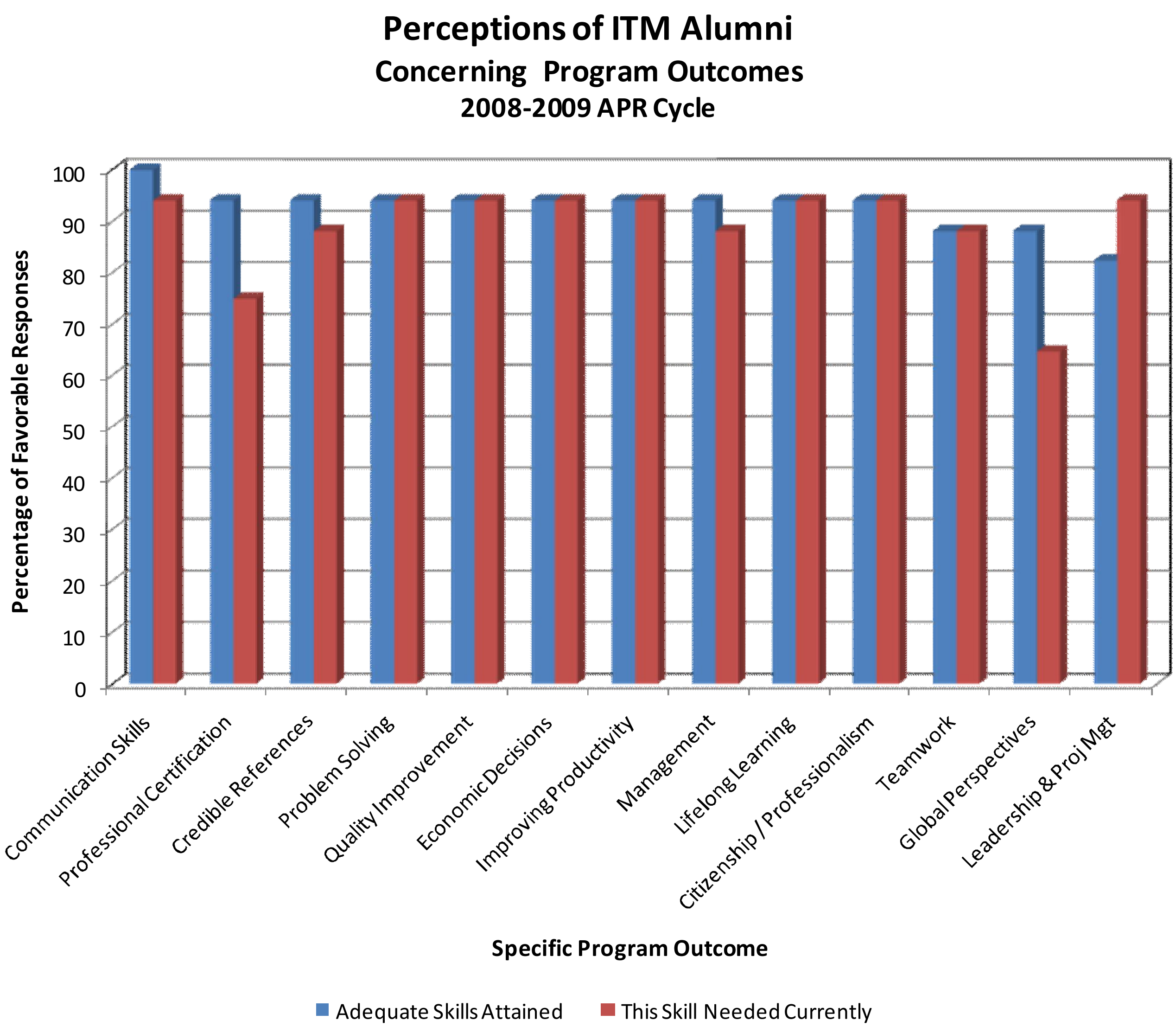

Figure 1 The favorable responses obtained from the survey of alumni of the Industrial Technology and Management Program at Ferris State University from February 2009 regarding specific program outcomes in Question 1 of the survey instrument.

In the case of Outcome number 12, only 63.4% of the respondents indicated a need for a 'Global Perspective' in their current positions. It is acknowledged that perhaps the manner in which this question was delivered allowed for a misunderstood response. Students claim to have gained sufficient knowledge in this area with 88.2% of respondents indicating a positive response. This specific outcome is perhaps the least relevant in the positions of various students, but in future survey instruments, the manner in which the question is asked will certainly be refined and adjusted.

Graduate Success

As reported previously, 87.5% of program alumni had a full-time position within six months of graduation. Given the economic difficulties in the industrial sector, especially in the State of Michigan, this figure is encouraging. The economic conditions in manufacturing are not anticipated to improve at any time in the near future, and the employment market for graduates of the program does not appear especially bright in this time-frame. Nonetheless, from the results obtained in the surveys of both alumni and members of the program Advisory Panel, it appears as though the ITM program is well-positioned for continued success, despite the economy. Figure 2 displays a distribution of the salaries enjoyed by graduates of the program, as reported from the alumni survey. The specific question in the survey instrument offered only a range for salary, as it was assumed this information would be kept private if a specific figure was asked in the question format. The average salary reported on Figure 2 of $62,400 annually, reflects a best-fit estimate within the middle of the available ranges on the survey. While these figures are attractive, it is important to note that students and graduates of the program are experienced professionals, and often have an attractive salary history even before they enrolled as students in the program.

One of the Objectives of the program is to prepare students for graduate study, if they choose this option. Since the program is relatively new, a strong record of success for program graduates in graduate programs is not available. However, there are some students that have enrolled in graduate programs of study, albeit a small number. Table VII displays the results which indicate whether the respondents of the survey have either attended graduate school programs or plan to attend graduate school as a student. The small sample size may not provide sufficient information for this particular matter, but the values reported indicate some success on behalf of program graduates in this realm. The current plans of program graduates indicate a strong possibility that many more alumni of the program will enroll in graduate studies at some point in the future. It is anticipated that at the next cycle of Academic Program Review, there will be better and more comprehensive information regarding this specific issue related to success of program graduates.

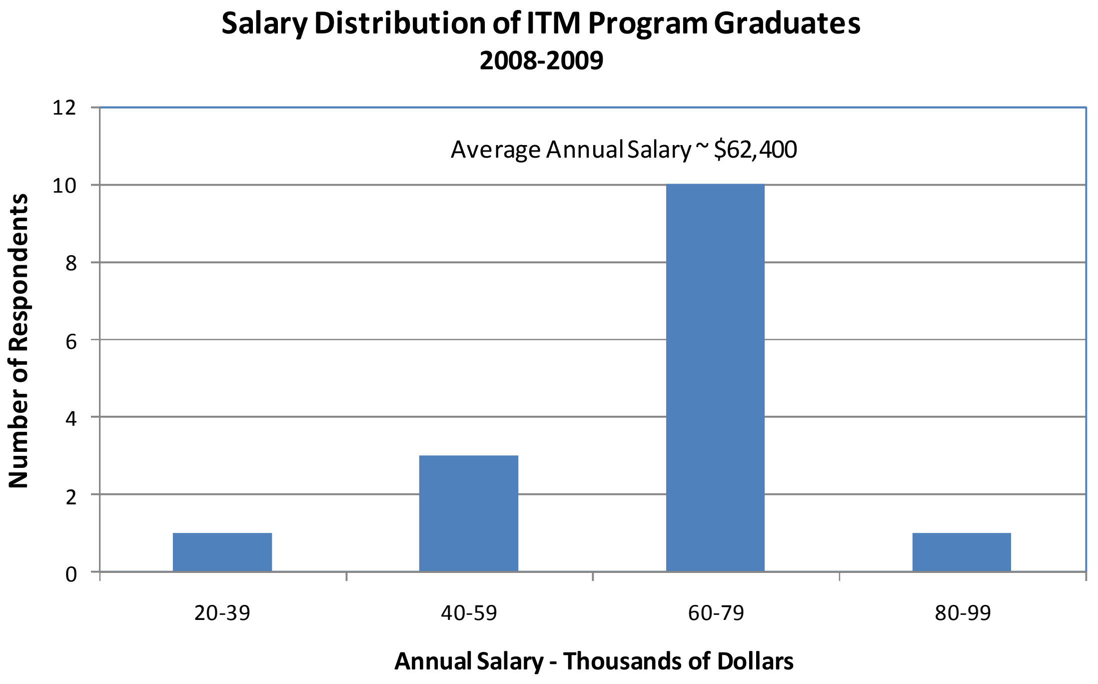

Figure 2 The average annual salary reported by graduates of the Industrial Technology and Management Program at Ferris State University from the February 2009 Academic Program Review survey.

Table VII
Results Obtained from Graduates of the Industrial Technology and Management Program At Ferris State University Which Indicates Enrollment in Graduate Programs of Study Or the Desire to Enroll in Graduate Programs of Study

Survey Item	*Percent of Respondents*
Currently Enrolled in Graduate Study	17.6%
Plan to Enroll in Graduate Studies	73.3%

The subsequent pages in this section offer the actual survey instrument given to graduates of the program. The actual results offered by the Office of Institutional Research and Testing begins on Page 2-41. Extensive discussion beyond those items already mentioned will not be undertaken at this time.

FERRIS STATE UNIVERSITY

ITM APR - Alumni

As part of the Academic Review Process, we are asking graduates of the Industrial Technology & Management program to take a few minutes and share with us their perceptions of the program.

Q1	Please indicate your level of agreement with each of the following statements.	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
	I obtained adequate skills in the ITM program for pertinent Professional Certification				
	I have a need for Professional Certification & it is relevant in my current position on a nearly daily basis				
	I obtained adequate skills in the ITM program for locating credible reference sources				
	I have a need for seeking & using credible sources of scholarly knowledge & its relevance in my current position on a regular basis				
	I obtained adequate skills in the ITM program for problem solving				
	I have a need for problem solving in my current position on a regular basis				
	I obtained adequate skills in the ITM program for contributing to quality improvement initiatives				
	I have a need for quality tools in my current position on a regular basis				
	I obtained adequate skills in the ITM program for making economic decisions				
	I have a need for making economic decisions in my current position on a regular basis				
	I obtained adequate skills in the ITM program for improving productivity				
	I have a need for improving productivity in my current position on a regular basis				
	I obtained adequate skills in the ITM program for communicating effectively				
	I use significant forms of communication in my current position on a regular basis				
	I obtained adequate skills in the ITM program for assuming a leadership role in project management				
	I have a need for project management & leadership in my current position on a regular basis				
	I obtained adequate skills in the ITM program for recognizing & improving team dynamics				
	I have a need for teamwork in my current position on a regular basis				
	I obtained adequate skills in the ITM program for a management role				
	I have a need for using management skills in my current position on a regular basis				
	I obtained adequate skills in the ITM program for recognizing & dealing with the unique challenges of global enterprises				
	I have a need for global enterprise knowledge in my current position on a regular basis				
	I obtained adequate skills in the ITM program for further professional development				

I have a need for lifelong learning & continued professional development in my current position on a regular basis	○	○	○	○
I obtained adequate skills in the ITM program for gaining confidence in my professionalism citizenship	○	○	○	○
I have a need for the application of citizenship & professionalism in my current position on a regular basis	○	○	○	○

Q2 Would you welcome an opportunity to serve on the program Advisory Panel?

- ○ Yes
- ○ No

Q3 Do you have professional certification?

- ○ Yes
- ○ No

Q4 If yes, please list them here:

Q5 Compared to your professional peers, do you perform better or worse and why?

Q6 My opinion of the best course in the program (please indicate the course and why you feel it was the best)

Q7 My opinion of the worst/least useful course in the program (please indicate the course and why you feel it was the worst/least useful)

Q8 My opinion of the best instructor in the program (who and why)

Q9 My opinion of the overall expertise & value of program instructors in general

Q10 Finish this: I wish we had done more

Q11 Finish this: I wish we had done less

Q12 The likelihood that you would enroll in this program again if your situation dictated it (and why/why not).

Q13 Within six months of graduation, did you obtain or retain employment?

- Yes
- No

Q14 Current job title

Q15 Employer name, City, State

Q16 Please provide your immediate supervisor's name

Q17 Please provide your immediate supervisor's email address

Q18 Have you furthered your studies in graduate school?

- Yes
- No

Q19 Do you intend to enroll in graduate school?

- Yes
- No

Q20 Where?

Q21 What program of study?

Q22 In what year did you receive your degree?

- 2006
- 2007
- 2008

Q23 Salary

- $20,000 or less
- $20,001-$39,999
- $40,000-$59,999
- $60,000-$79,999
- $80,000-$99,999
- $100,000 or more
- Not Applicable

Q24 How long in this position?

Q25 **Number of years working in this industry in any capcity.**

Q26 **Gender**
- Male
- Female
- Transgender

Q27 **Race**
- African-American/Black
- Asian-American/Pacific Islander
- Native American/Inuit
- Hispanic/Latino/Chicano
- Caucasian-American/White
- Multiracial
- Other
- Prefer not to respond

Q28 **Please use this space for additional comments/suggestions.**

Thank you for your time and feedback.

B. Employers of Program Alumni

A survey was offered to the employers of program alumni in order to provide additional input concerning assessment of the program. A full copy of the survey instrument is offered on subsequent pages of this portion of the report, along with the complete results, compiled by the Office of Institutional Research and Testing. The report was developed and subsequently refined by the Program Review Panel, and delivered via email to employers in April 2009. The results were very disappointing, for the overall sample size was too small to obtain worthwhile input for program improvement. A total of 7 surveys were delivered to employers of program alumni, and 2 responses were received, a response rate of 28.5%. In addition, the two respondents did not have a typical manufacturing emphasis or background. One respondent worked in a public school system, and the other was from an electric utility provider. While these sparse results speak to the relative versatility of program graduates, these employers would be considered atypical, nonetheless.

The purpose of the survey was similar to that of the alumni survey, but with slightly different objectives. The intent was to give the opportunity for feedback with regard to either strengths or weaknesses in skill sets of program alumni, in terms of the program outcomes. The question format was delivered in a similar manner to enable minimal inconvenience for each respondent, and the initial goal was to deliver a survey that required from 5-10 minutes for completion. The specific format and content of questions is displayed in the actual survey instrument, beginning on Page 2-14. The vast majority of questions used a 4-point Likert scale, with the intent of obtaining responses which indicate 'favorable' or 'unfavorable' from the respondent, with varying degrees of each respective response embedded in each question. The instrument afforded these employers the opportunity to give direct feedback to the program faculty and Program Review Panel for the purpose of overall program assessment. Similar to the survey offered to alumni or even current students of the program, a 7-point rating scale may have been a better overall approach to assessing quality of graduates and aspects of the program in order to initiate worthwhile changes.

Even though the sample size is small, and the 'industry' served in each case was atypical, in general it appears as though perceptions of the program from employers of graduates are mostly positive. Table VIII displays a portion of the notable highlights and summarizes many of the results obtained from questions specific to the skills and ability of graduates. In addition to the results presented, there were indications that neither firm represented was anticipating hiring additional workers within the next year. Although this result is discouraging for current students in the program, given the economic climate it is not unexpected.

Table VIII
Responses Offered From Surveys Given to Employers of the Graduates of the Industrial Technology and Management at Ferris State University

Question No.	Question	Favorable Response Rate
4	How well prepared was the graduate for entering the workforce?	100%
8b	ITM graduates contribute as graduates from other programs in the workplace	100%
8c	The ITM program provides multiple career opportunities	100%
8d	It appears as though adequate placement assistance is given to Ferris ITM graduates	50%
9	Our firm has experienced difficulty in hiring technical managers	50%

The very small sample size of employer responses does not allow meaningful interpretation of the information obtained from the surveys. Regardless of this, reporting and reflection on this information could prove useful in long term planning and strategic efforts. In terms of program outcomes, Figure 3 displays results obtained from the survey regarding the relative importance of the various program outcomes. Given the nature of the respondents, these results could be predicted, but this information still offers some insight into somewhat universal skill sets for those people that may be seeking employment in the present economic climate. Referring to Figure 3, of particular note are the 'necessary' skill sets which correspond to the program outcomes. Virtually all the skills and outcomes listed were deemed as 'important' from the perspective of these individuals. While the overall data obtained from the survey may not contain worthwhile assessment information, the data indicate that the skills and outcomes important to the ITM program are very relevant and worthwhile, regardless of the profession and position of program alumni. It is hoped that during the next Academic Program Review cycle, worthwhile information can be obtained from the surveys administered in order to offer tangible efforts for improvement of the program.

In terms of additional questions in the survey regarding the need for specific program courses as part of the job functions of the two alumni, the results did not offer worthwhile feedback for overall program assessment. Some of the courses were deemed 'Greatly Needed,' while many others were either 'Very Little,' or 'Not at All.' Given the nature of each firm that responded to the survey, it was not expected that there would be information that indicated a high correlation of program courses with those skills needed at these specific firms. While this feedback is disappointing, it was determined that it was not as relevant or pertinent if the overall sample size were larger.

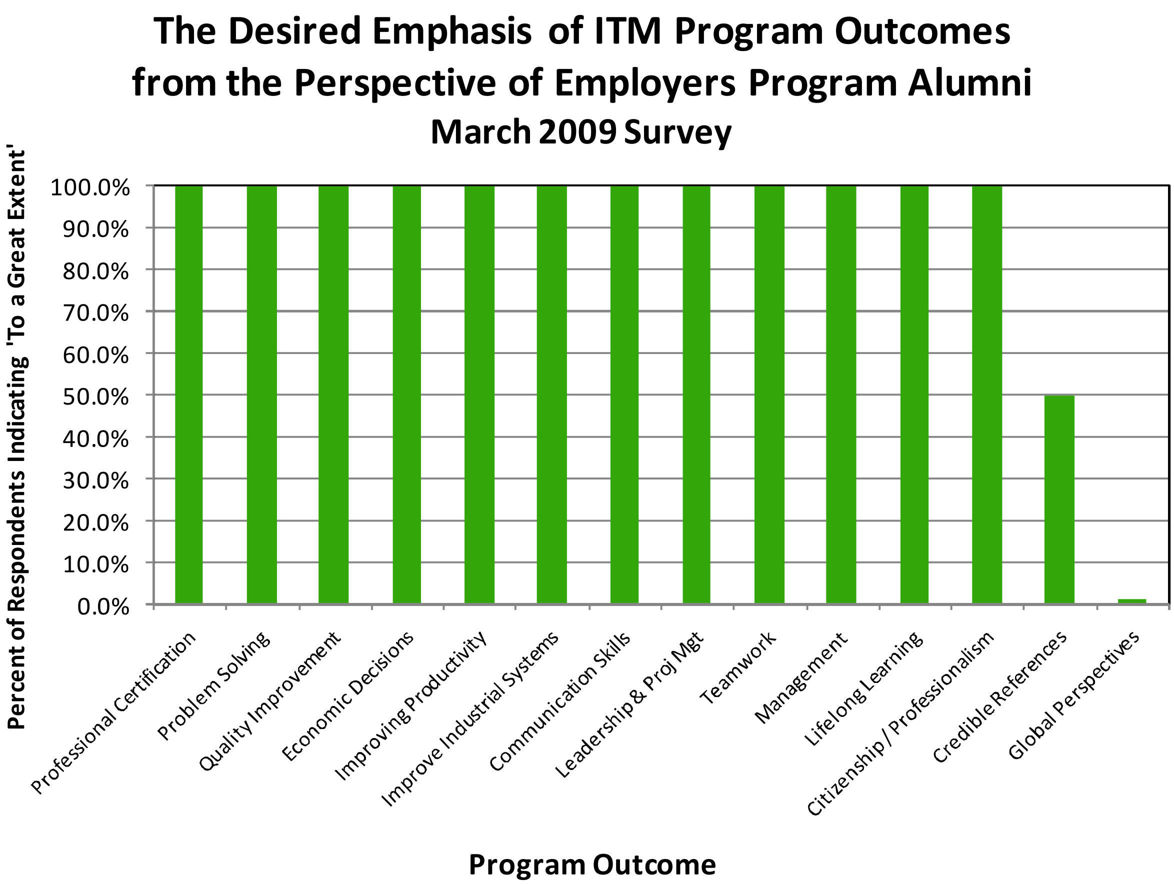

Figure 3: The favorable responses obtained from the survey of employers of alumni of the Industrial Technology and Management Program at Ferris State University from February 2009 regarding specific program outcomes in Question 6 of the survey instrument.

As stated previously, it was disappointing that the results obtained from employers of program alumni were not more comprehensive. The subsequent pages in this section offer the actual survey instrument given to employers of alumni of the program. The actual results offered by the Office of Institutional Research and Testing begins on Page 2-60. Extensive discussion beyond those items already mentioned will not be undertaken at this time.

FERRIS STATE UNIVERSITY

ITM APR - Employer Survey

The Department of Industrial Technology & Management at Ferris State University is conducting a survey of employers of typical ITM graduates to be used in the continuing development and improvement of the ITM program. Thank you for taking the time to complete this survey. Your answers will be of great help in determining the future direction of the program.

Q1 Approximately how many employees work at your facility?

- ○ Less than 50
- ○ 50-100
- ○ 101-500
- ○ 501-1,000
- ○ Over 1,000

Q2 What description best fits your company's primary activity? *(Please select all that apply.)*

- ☐ Welding Equipment
- ☐ Robotics & Automation
- ☐ Manufacturing & Fabrication
- ☐ Consulting
- ☐ Construction
- ☐ Automotive
- ☐ Agricultural/Construction Equipment
- ☐ Aerospace/Shipbuilding
- ☐ Other

Please Specify: ______

Q3 Does your company currently have one or more Ferris State University ITM graduates on staff?

- ○ Yes
- ○ No
- ○ Unsure

Q4 If so, how well do you feel that the FSU graduate(s) was/were prepared to work for your company?

- ○ Very Unprepared
- ○ Somewhat Unprepared
- ○ Somewhat Prepared
- ○ Very Prepared

Q5 Please include any comments about the preparedness of the graduate(s) here.

______

Q6 Considering your current facility and place of employment, imagine that you were in the position to hire a graduate of the ITM program. Please share the extent of the need of the following skills that are required at your firm.

	Not Needed	Somewhat Needed	Greatly Needed	Does Not Apply
Professional Certification	○	○	○	○
Seek technical references	○	○	○	○
Problem Solving/Decision Making	○	○	○	○
Quality improvement initiatives	○	○	○	○
Perform economic analyses	○	○	○	○
Productivity Improvement	○	○	○	○
Improve industrial systems	○	○	○	○
Effective communication	○	○	○	○
Leadership/Project Management	○	○	○	○
Effective teamwork	○	○	○	○
Management skills	○	○	○	○
International Enterprises & Strategy	○	○	○	○
Personal growth & assessment	○	○	○	○
Citizenship & professionalism	○	○	○	○

Q7 Please indicate the extent to which your organization requires the course knowledge for each of the program's required courses listed below.

	Not at All	Very Little	Somewhat	To a Great Extent
Computer Aided Design & Drafting	○	○	○	○
General Automation Technologies	○	○	○	○
Lean Manufacturing Methods	○	○	○	○
Management Fundamentals	○	○	○	○
Emerging Topics in Management	○	○	○	○
Project Management	○	○	○	○
ISO/TS/QS Certification	○	○	○	○
Statistics & Statistical Methods	○	○	○	○
Manufacturing Processes	○	○	○	○
Manufacturing Improvement Methods	○	○	○	○
Engineering Economics	○	○	○	○
Operations Management	○	○	○	○
Other	○	○	○	○

Please Specify:

Q8 **Please indicate your level of agreement with each of the following statements.**

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
The Ferris State University ITM program prepares students to enter industry better than other schools.	◯	◯	◯	◯
ITM graduates contribute as much as graduates from other programs in their first 6 months of employment.	◯	◯	◯	◯
The ITM program provides a foundation for multiple career possibilities.	◯	◯	◯	◯
Adequate placement assistance is provided to graduates.	◯	◯	◯	◯

Q9 **During the last year, has your company experienced difficulty in hiring qualified technical managers?**

- ◯ Yes
- ◯ No
- ◯ Don't know/Not applicable

Q10 **Please indicate your best estimate describing the growth potential for technical managers at your company during the next year.**

- ◯ Probable reduction in staff
- ◯ Average/Steady
- ◯ Probable increase in staff

Q11 **When hiring a new graduate for a technical manager position, which type of degree do you prefer? *(Please select only one.)***

- ◯ Engineering Technology
- ◯ Engineering
- ◯ ITM (Business blend)
- ◯ No Preference

Q12 **Please use this space to provide any additional comments/suggestions you have *regarding the* ITM program at Ferris State University.**

Q13 **Please use this space to provide any additional *general* comments.**

Thank you for your time and assistance.

C. Exit Surveys of Graduating Students

In early 2006, as the first students of the program were approaching degree completion, an exit survey was developed for graduates. The survey instrument was an attempt to allow for program assessment, but at that time, firm program outcomes did not exist. The questions and format were not summative in nature and offered little for tangible improvement efforts of the program. The surveys were fairly cumbersome, and often required nearly 20 minutes to complete. As a result, worthwhile data from these survey instruments is unavailable at this time. At last estimate, from the 15 surveys delivered to the early graduates of the program, only three (3) were returned, a response rate of 20%. The actual instrument used for this purpose is available for review on subsequent pages of this section of the report beginning on Page 2-19.

Since this initial survey was developed, the program faculty members have learned a great deal about overall program assessment and intend to formulate a better plan of action to incorporate exit surveys in overall program assessment matters. Following the Academic Program Review process for this program, it is intended to reformulate the graduating student exit survey to better serve the needs of the program and it students.

Given the three responses from graduates of the program, these results can be summarized very quickly, although it is acknowledged that given the very small sample size, the worthwhile nature and true validity of the information is suspect. The primary questions which deal with ‘ratings’ of various issues in the program indicated a favorable rating of the program in terms of quality of education received, quality of instructors, and skills learned (or observed). For survey questions which asked for numerical ratings from 1 – 10 (poor to excellent, respectively), virtually all responses were from 7 – 9 in the survey instrument.

The exit surveys also asked students to indicate specific areas where they perceived the program was either lacking in coverage or perhaps overemphasized. Since the students have a wide array of positions and responsibilities, the answers to this question would be expected to cover a wide spectrum. The answers obtained from this information are displayed in Table IX. Once the program faculty reviewed these results, it was determined that the survey instrument was only to assess opinions of student perceptions, and that worthwhile information to improve the program would be unlikely from the survey. When it was announced that the program was to undergo the Academic Program Review process, these specific surveys were abandoned while plans were being developed for more extensive survey instruments used in the self-study process. Following the delivery of this report, it is anticipated that a different Exit Survey instrument will be developed which encompasses many of the general intentions of the Alumni Survey presented in Section 2-A.

Table IX
Summary of Student Perceptions Obtained from Exit Surveys of Graduates of the industrial Technology and Management Program at Ferris State University from 2006 – 2007 Regarding Areas of Program Emphasis

Item	Student Responses
Most Valuable Topics Learned in the Program	- Project Mgmt - MS Project - In Depth Problem Solving - Versatility of Subject Matter - Keep an Open Mind Regarding New Ideas - Engineering Economics (ROI) - Designed Experiments - Operations Management - Management & Supervision
Items That Perhaps Should not have been covered so extensively	- Nothing – it is all relevant - Basic electricity (previous program course) - Technical writing - Plant layout
Items that belong in the program which were not covered	- More engineering economics coverage - Accounting principles - Six-Sigma and Continuous Improvement - More plant layout coverage exercises - Oral communication as it relates to work - More feedback from presentations
Specific Topics in the Program Used in My Position (coverage fit)	- Globalization of firms / Global competition - Oral and written communication - Decision Making - Lean Manufacturing
Specific Topics in the Program with emphasis as-delivered	- Oral and written communication - Globalization of firms / Global competition - Lean Manufacturing - Quality improvement - Business metrics - Problem solving

It is acknowledged that while the information obtained from the exit surveys gives favorable opinions of the program in general, the use of the results for assessment and improvement have not proven to be useful. It is intended that the improved version of the exit survey will remedy this matter.

Exit Survey and Student Assessment

Graduates of Industrial Technology and Management (ITM)

You are now an alumnus of Ferris State University! Congratulations and we hope your hard work and dedication pay personal and professional dividends in the years to come. We will now ask you for some of your opinions that speak about the overall ITM program at Ferris. Not only does Ferris State University require this type of information, it is also required by accreditation bodies to demonstrate our efforts for continuous improvement and striving to deliver quality and worthwhile education. Please take some time to provide us with information as to how you see the program now, as well as suggestions for possible improvement in the future.

1. Name the three most valuable items you learned in the ITM program

2. Name at least two items that were covered extensively in the program that you wish were not covered, because you either:
   a. Had previous extensive knowledge
   b. Had no need for coverage of this topic

3. Were there any particular topics that you wish were covered that were not, or those that needed to be covered more extensively? (name these and comment)

4. On a scale from 1 (poor) to 10 (excellent), rate the overall quality of your education in the Ferris ITM program

(poor)		(undesirable)			(useful)				(excellent)
1	2	3	4	5	6	7	8	9	10

Comments:

5. On a scale from 1 (poor) to 10 (excellent), rate the overall quality of instructors from the ITM program

(poor)		(undesirable)			(useful)				(excellent)
1	2	3	4	5	6	7	8	9	10

Comments:

6. From question 4 (instruction), are there any specific instructors that stand out as either excellent or poor? (You can comment on any number of instructors and use the back of this page as necessary)

   Excellent:

   Why?

   Poor:

   Why?

7. Below is a table which contains 12 key items identified by the ITM Advisory Board as useful and critical for graduates of the ITM program. The list is presented in alphabetical order. On a scale from 1 (poor) to 10 (outstanding), please rank each of these skills as their importance or emphasis in your current position (or previous positions) AND how effective the ITM program was in delivering content and skill building in this area of emphasis.

Keys Areas of Knowledge for Ferris ITM Graduates

Skill / Key Knowledge Item	*Importance (1-10)*	*Ferris Program Preparation (1-10)*
Communication – Oral and Written		
Cost Estimating and Accounting		
Decision Making		
Global Competition / Globalization		
In-depth Problem Solving		
Lean Manufacturing		
Management & Supervision		
Plant Layout & Materials Handling		
Project Management		
Quality Improvement		
Understand business metrics		
Work Design		

Comments:

8. In your opinion, what should change in the coverage of topics in the current program? Why?

9. In your opinion, what are the strongest features of the Ferris ITM program?

10. In your opinion, what are the areas that require the most improvement in the Ferris ITM program? Why?

Thank you for your input. We will use this information to refine the ITM program and strengthen it in many aspects. Good luck in your future endeavors and do not be afraid to keep in touch!

Employer Assessment

For Graduates of Industrial Technology and Management (ITM) – Ferris State Univ.

You have the pleasure of working with an alumnus of Ferris State University! In the spirit of continuous improvement of our programs, we will now ask you for some of your opinions that speak about the overall ITM program at Ferris and impressions of your employee. Not only does Ferris State University require information like this for assessment of our programs, it is also required as we seek additional accreditation for our program to demonstrate our efforts for continuous improvement and striving to deliver quality and worthwhile education. Please take some time to provide us with as much information as you can concerning your employee and their relationship to the Ferris ITM Program. Your responses will be confidential.

Name of Ferris Employee ____

Their Job Title ____

Number of years this person has been employed at your firm ____________

Number of years in this job or similar (your firm) _____________________

Their Salary _______________________________________

Your job title ____

Number of years in this job or similar ______________________________

1. What are the strongest qualities of the Ferris graduate listed above?

2. Was there anything specific that allowed this candidate to stand out among others?

3. Can you recall anything specific this person learned from the Ferris Industrial Technology and Management Program that was brought to your organization?

4. On a scale from 1 (poor) to 10 (excellent), rate the overall skills of the person listed

(poor)		(lacking)				(ample)			(excellent)
1	2	3	4	5	6	7	8	9	10

Comments:

5. On a scale from 1 (poor) to 10 (excellent), rate the skills of the person listed above which were obtained from the Ferris ITM program (to the best of your knowledge)

(poor)		(lacking)				(ample)			(excellent)
1	2	3	4	5	6	7	8	9	10

Comments:

6. On a scale from 1 (poor) to 10 (excellent), rate the person listed above in overall potential for ADVANCEMENT

(poor)		(unlikely)				(likely)			(excellent)
1	2	3	4	5	6	7	8	9	10

Comments:

7. On a scale from 1 (poor) to 10 (excellent), rate this person compared to their peers (similar positions) in potential for ADVANCEMENT

(poor)		(unlikely)				(likely)			(excellent)
1	2	3	4	5	6	7	8	9	10

Comments:

8. Concerning the person listed above, please comment on their strong or weak points compared to their peers in similar positions.

9. Below is a table which contains 12 key items identified by the ITM Advisory Board as useful and critical for graduates of the ITM program. The list is presented in alphabetical order. Please place a check mark in skill or knowledge areas that you see as critical at your firm for the position listed above, as well as a check mark in those items which the Ferris graduate listed above has strong skills or knowledge.

Keys Areas of Skills and Knowledge for ITM Graduates

Skill / Key Knowledge Item	*Importance at Your Firm*	*Strong Points of Ferris Graduate*
Communication – Oral and Written		
Cost Estimating and Accounting		
Decision Making		
Global Competition / Globalization		
In-depth Problem Solving		
Lean Manufacturing		
Management & Supervision		
Plant Layout & Materials Handling		
Project Management		
Quality Improvement		
Understand and use business metrics		
Work Design		

Comments:

10. In your opinion, what skills or knowledge areas does the Ferris graduate listed above require the most improvement? (these comments do not need to be listed in the table above)

11. Do you have an interest in joining an Advisory Committee for the Ferris ITM program? (comment briefly – enclose a business card if interested)

Thank you for your input. We will use this information to refine the ITM program and strengthen it in many aspects. We look forward to perhaps sharing other qualified candidates from the ITM program with you in the future.

D. Current Students in the Program

The Program Review Panel offered a survey for current students of the program in order to gather information concerning the perspectives of students for the purposes of this assessment report. A full copy of the survey instrument is offered on subsequent pages of this portion of the report, along with the complete results, compiled by the Office of Institutional Research and Testing. The report was developed and subsequently refined by the Program Review Panel, and delivered via email to students in the program in February 2009. A total of 124 surveys were delivered to students, and 29 responses were received, a response rate of 23.4%.

The survey instrument had a very similar intent as the alumni survey, along with similar objectives. The questions were adjusted slightly to reflect the different perspective of existing students. The actual survey instrument is available beginning on Page 2-28 of this section of the document. In general, it appears as though perceptions of the program from current students are also highly positive. Prior to offering the complete results, some notable highlights are offered below.

Student Satisfaction

A wide variety of questions were asked in the survey, but perhaps the most direct questions dealing with program quality are listed in Table X below. Indicated are three questions asked of the current students and the summary of responses for students that resulted in a favorable rating. In this and in all subsequent cases, answers which contained 'Strongly Agree' or 'Somewhat Agree' are shown as favorable. The results indicate broad satisfaction from current students in the program. Additional comments can be reviewed from the complete results offered on subsequent pages of this section.

Table X
Summary of Direct Questions of Quality from Current Students in the Industrial Technology and Management Program Obtained from Surveys Delivered early in 2009

Question No.	Question Related to Program Quality	Percentage of Favorable Responses
5	I perform as well or better than my peers	83.3%
9	The Overall Expertise and Value of Instructors in the Program was 'good' or better	84.6%
12	I would enroll in this program again if given the opportunity	95.7%

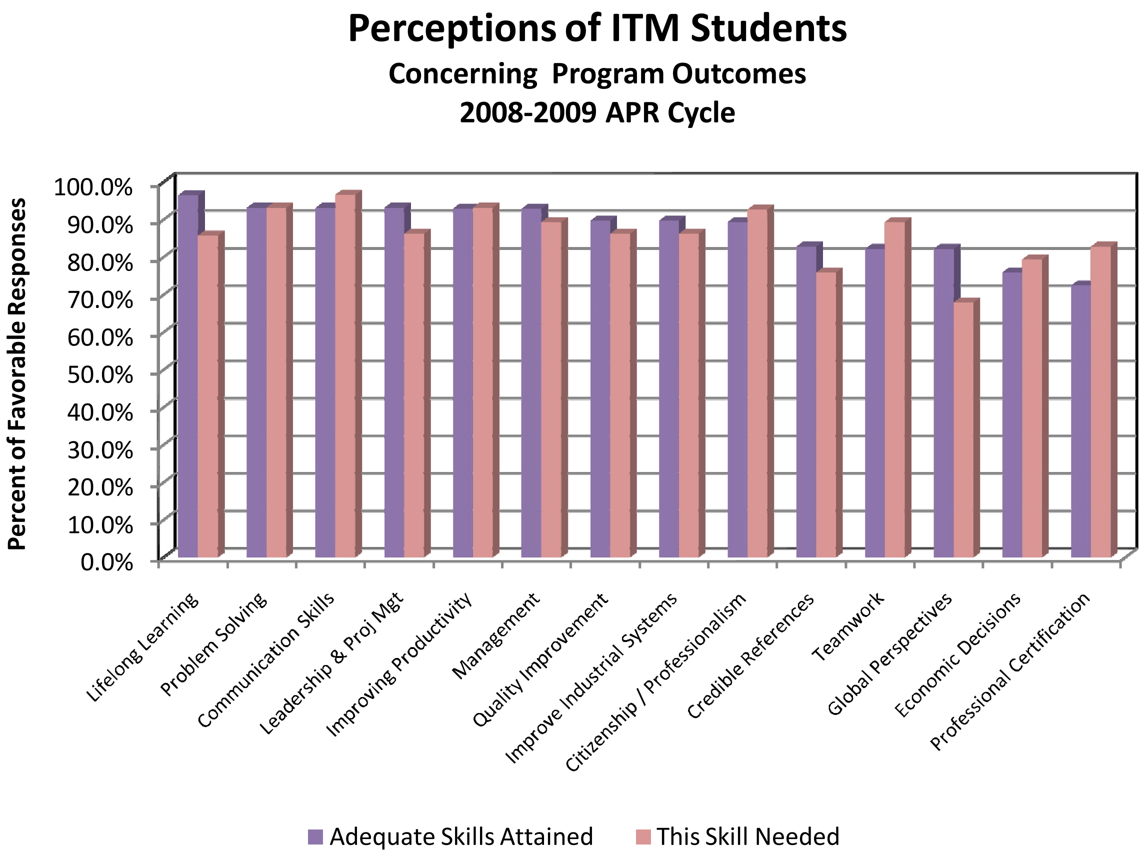

Figure 4: The responses obtained from the survey of alumni of the Industrial Technology and Management Program at Ferris State University from February 2009 regarding the relative favorability of specific program outcomes in Question 1 of the survey instrument.

Outcomes Assessment

The program outcomes were surveyed in an identical manner as reported previously with program alumni. A summary of these results is displayed in Figure 4. The responses are highly favorable concerning whether the respondent was able to attain the necessary level of knowledge of skill in each sub-discipline which is related directly to specific outcomes. The results obtained from current students in the program are very similar to those obtained from program graduates, reported in Section 2-A. Given that the students surveyed have a wide array of program experience, ranging from first semester students to those nearly complete, a slightly different response in terms of the adequacy of learning the student outcomes is expected. The results do reflect this, in that virtually all the responses indicated whether adequate skills have been attained are lower than those from the alumni of the program. In addition, many of the current students have positions dissimilar to where they anticipate as a result of program completion, so the results should not be expected to be precisely the same as those obtained from the established graduates of the program.

The subsequent pages in this section offer the actual survey instrument given to graduates of the program. The results compiled by the Office of Institutional Research and Testing are offered at the conclusion of Section 2 for reference, beginning on Page 2-70. Extensive discussion beyond those items already mentioned will not be undertaken at this time.

FERRIS STATE UNIVERSITY

ITM APR - Current Students

The Industrial Technology & Management Program is asking its current students to assist with the Academic Program Review by giving us your opinion about various aspects of the program and your experiences.

Q1 **Please indicate your level of agreement with the following statements.**

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
I have a need for Professional Certification & it is relevant in my current position on a nearly daily basis.	○	○	○	○
I am obtaining adequate sills in the ITM program for locating credible reference sources.	○	○	○	○
I have a need for seeking & using credible sources of scholarly knowledge & its relevance in my current position on a regular basis.	○	○	○	○
I am obtaining adequate skills in the ITM program for problem solving.	○	○	○	○
I have a need for problem solving in my current position on a regular basis.	○	○	○	○
I am obtaining adequate skills in the ITM program for contributing to quality improvement initiatives.	○	○	○	○
I have a need for quality tools in my current position on a regular basis.	○	○	○	○
I am obtaining adequate skills in the ITM program for making economic decisions.	○	○	○	○
I have a need for making economic decisions in my current position on a regular basis.	○	○	○	○
I am obtaining adequate skills in the ITM program for improving productivity.	○	○	○	○
I have a need for improving productivity in my current position on a regular basis.	○	○	○	○
I am obtaining adequate skills in the ITM program for improving industrial systems.	○	○	○	○
I have a need for improving industrial systems in my current position on a regular basis.	○	○	○	○
I am obtaining adequate skills in the ITM program for communicating effectively.	○	○	○	○
I use significant forms of communication in my current position on a regular basis.	○	○	○	○
I am obtaining adequate skills in the ITM program for assuming a leadership role in project management.	○	○	○	○
I have a need for project management & leadership in my current position on a regular basis.	○	○	○	○
I am obtaining adequate skills in the ITM program for recognizing & improving team dynamics	○	○	○	○
I have a need for teamwork in my current position on a regular basis.	○	○	○	○
I am obtaining adequate skills in the ITM program for a management role.	○	○	○	○
I have a need for using management skills in my current position on a regular basis.	○	○	○	○
I am obtaining adequate skills in the ITM program for recognizing & dealing with the unique challenges of global enterprises.	○	○	○	○
I have a need for global enteprise knowledge in my current position on a regular basis.	○	○	○	○

I am obtaining adequate skills in the ITM program for further professional development.	◯	◯	◯	◯
I have a need for lifelong learning & continued professional development in my current position on a regular basis	◯	◯	◯	◯
I am obtaining adequate skills in the ITM program for gaining confidence in my professionalism & citizenship.	◯	◯	◯	◯
I have a need for the application of citizenship & professionalism in my current position on a regular basis.	◯	◯	◯	◯

Q2 Do you have professional certification?

- ◯ Yes
- ◯ No

Q3 If yes, please list your certifications here.

Q4 Do you intend to see professional certification when finished with your degree?

- ◯ Yes
- ◯ No

Q5 If yes, which kind?

Q6 What is the primary reason you enrolled in the ITM program?

Q7 How long have you been enrolled in the ITM program?

Q8 Your target date for completion/graduation from the program?

Q9 Current job title

Q10 Employer name, City, State

Q11 Salary

- ◯ $20,000 or less
- ◯ $20,001-$39,999
- ◯ $40,000-$59,999
- ◯ $60,000-$79,999
- ◯ $80,000-$99,999
- ◯ $100,000 or more
- ◯ Not Applicable

Q12 How long in this position?

Q13 Number of years working in this industry in any capcity.

Q14 Gender

- Male
- Female
- Transgender

Q15 Race

- African-American/Black
- Asian-American/Pacific Islander
- Native American/Inuit
- Hispanic/Latino/Chicano
- Caucasian-American/White
- Multiracial
- Other
- Prefer not to respond

Q16 Compared to your professional peers, do you perform better or worse and why?

Q17 My opinion of the best course in the program (please indicate the course and why you feel it was the best):

Q18 My opinion of the worst/least useful course in the program (please indicate the course and why you feel it was the worst/least useful):

Q19 My opinion of the best instructor in the program (who and why):

Q20 My opinion of the overall expertise & value of program instructors in general:

Q21 Finish this: I wish we would do more...

Q22 Finish this: I wish we would not spend as much time on...

Q23 The likelihood that you would enroll in this program again if your situation dictated it (and why/why not):

Q24 Please use this space for additional comments/suggestions.

Thank you for your time and feedback.

E. Program Advisory Panel

The Program Review Panel offered a survey for members of the Advisory Panel of the program in order to gather information concerning the perspectives of members of the Advisory Panel for the purposes of this assessment report. A full copy of the survey instrument is offered on subsequent pages of this portion of the report, along with the complete results, compiled by the Office of Institutional Research and Testing. The report was developed and subsequently refined by the Program Review Panel, and delivered via email to members of the Advisory Panel in February 2009. A total of 12 surveys were delivered to Advisory Panel members, and 7 responses were received, a response rate of 58.3%.

The purpose of the survey was slightly different than surveys given to students or former students. Given that Advisory Panel members are similar technical professionals, and often in the position to offer potential employment to graduates of the program, the emphasis of their input was altered to reflect this position. The question format was delivered in order to enable minimal inconvenience for each respondent, and the initial goal was to deliver a survey that required from 5-10 minutes for completion. The specific format and content of questions is displayed in the actual survey instrument, beginning on Page 2-38. The vast majority of questions used a 4-point Likert scale, with the intent of obtaining responses which indicate 'favorable' or 'unfavorable' from the respondent, with varying degrees of each respective response embedded in each question. The instrument afforded members of the Advisory Panel the opportunity to give direct feedback to the program faculty and Program Review Panel for the purpose of overall program assessment. The primary intent of these results was to determine whether or not the program contains appropriate content for its intended student audience. In addition to program outcomes, questions were asked which pertain directly to program-specific courses, and how well the topics in these courses pertain to the needs of positions in the manufacturing sector.

The results obtained from the surveys give a very favorable impression of the program from an outside source. This result can be highlighted in numerous target questions, but for those which relate to the Ferris Mission, student opportunities or enabling the success of program graduates, the results reported offer insightful information which is useful for further direction and program refinement. An example of some of these questions and corresponding responses from members of the Advisory Panel are listed in Table XI.

Table XI
Specific Questions and Corresponding Responses Offered
From Surveys Given to Members of the Advisory Panel of
Industrial Technology and Management at Ferris State University

Question No.	Question	Favorable Response Rate
1a	The Program is Consistent with the Ferris Mission	100%
1b	Students are well prepared to enter the workforce	100% *
1e	The Program provides a foundation for multiple career opportunities	100%
1f	Job opportunities are available to graduates of this program	100% *

* Note: These items included a single response that indicated: "Unable to Judge"

Members of the Advisory Panel were asked to comment on specific aspects of the program. In terms of the strengths of the program the responses included the following list:

- A broad based education, networking opportunities with other
- Industry professionals and strong instructors
- Enrolling people who are currently employed and who are motivated to learn
- The combination of technology and business education, and how they complement each other
- The diversity of the offerings
- The exposure of the students to a wide range of topics related to industry. Utilizing "real world" instructors adds legitimacy to the program.
- Works well with the non-traditional student that has practical work experience that needs to be rounded out with academics.

These individuals were also asked to offer insights on areas of topical coverage which could be expanded or included for greater emphasis in the program. Their comments on this specific item are listed below:

- Effective teamwork and communication are the non technical cornerstones for upward mobility. Need a formal course to focus and improve their skill sets on these topics
- Effective written and verbal communication skills Effective Teamwork and interpersonal skills
- General management skills
- Get more students into real world co-op experiences/projects
- I think more emphasis on written communication is required
- Ideas aren't any good if they cannot be conveyed
- Offer more classes, more often

Given these lists and the content therein, it becomes apparent that there is considerable synergy between the program outcomes and areas of emphasis. From the perspective of the students from Sections 2 A and 2 B, it appears as though the objectives are being attained, and the program has success as it is defined. A number of these specific items will be addressed in greater detail in Section 3 of this document, but it bears noting that the program is achieving its intended goals and reaching its intended outcomes in a variety of manners from various perspectives.

The program outcomes were assessed in a manner slightly different from that which was done for the students and graduates of the program. To ensure that the program was seeking proper focus and direction, each outcome was presented as to the degree to which this skill was needed in the workforce. The members of the panel agreed in a unanimous manner that all these outcomes were 'favorable' in the workforce. Figure 5 displays the necessity of the program outcomes from the perspective of members of the Advisory Panel. This figure indicates that well over half the program outcomes could be considered 'critical' for graduates in the workforce today. It should be noted that those items with lower scores are not necessarily less important, for all members of the panel indicated favorable ratings to each and every program outcome. With the information, the program faculty members can ascertain whether changes or adjustments in focus might be necessary. At this time, it appears as though only minor adjustments may be in order.

For individual program courses, a similar set of questions was asked to determine whether or not the existing emphasis in the program coverage is proper for the skills needed in the workforce. For each and every program course, there was an overwhelming favorable rating as to whether this skill and knowledge is needed for graduates of the program. Only a single course did not receive a unanimous favorable rating from the Advisory Panel, and the question was directed toward the course APPS 420 – Manufacturing Certification and Standardization. When asked if there were other areas of emphasis that could be offered or shifted in the program, there were suggestions which point to additional focus on communication – both written and oral. This emphasis in the program has been evolving and is expected to continue to adjust as faculty members gain additional experience with this student population.

Given this information, it does appear as though the direction and emphasis of the program is proper at this time. Minor adjustments are expected to occur as a result of the survey results from all four focus groups. Continuous refinement of topics is also anticipated as the needs of the employment market are monitored over the next several years. The assistance of the Advisory Panel has been invaluable in attaining and refining the program outcomes, and subsequent coverage and emphasis in the overall program and its direction.

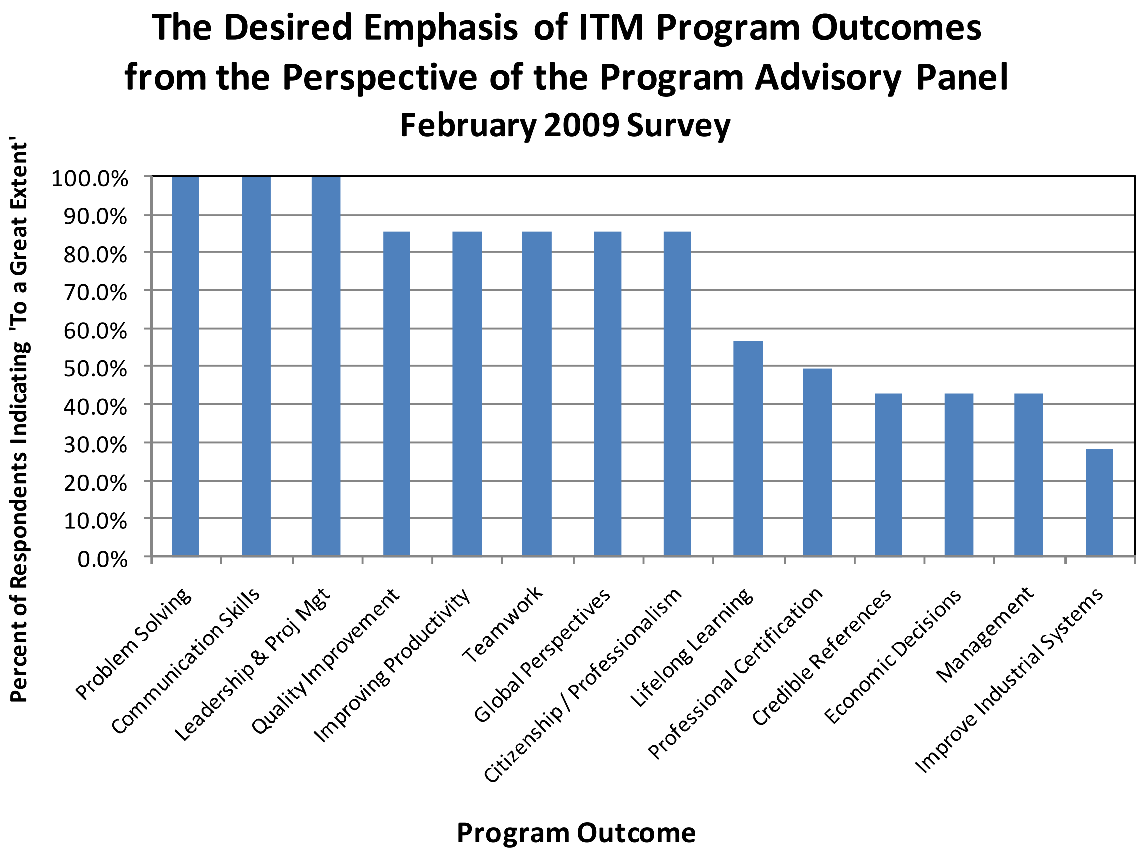

Figure 5: Results of obtained from a February 2009 survey of the members of the Advisory Panel for the Industrial Technology and Management Program at Ferris State University. Indicated are the responses concerning the program outcomes, and whether each of these items is needed in the workforce 'To a Great Extent."

The subsequent pages in this section offer the actual survey instrument given to graduates of the program. The results compiled by the Office of Institutional Research and Testing are offered at the conclusion of Section 2, beginning on Page 2-94. Extensive discussion beyond those items already mentioned will not be undertaken at this time.

FERRIS STATE UNIVERSITY

Industrial Technology & Management Program APR - Advisory Board

As part of the Academic Program Review (APR), the Industrial Technology & Management Program is asking advisory panel members to take a few minutes to fill out this survey regarding the program.

Q1 Please indicate your level of agreement with each of the following statements.

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree	Unable to Judge
ITM programs are consistent with the mission of Ferris State University	○	○	○	○	○
ITM students are well prepared to enter the workforce	○	○	○	○	○
Ferris State University's ITM program prepares students to enter industry better than other schools with similar programs	○	○	○	○	○
ITM program graduates contribute as much as graduates from similar programs in their first 6 months of employment	○	○	○	○	○
ITM program provides a foundation for multiple career possibilities	○	○	○	○	○
There are job opportunities available to Ferris State University ITM graduates	○	○	○	○	○

Q2 **Considering your current facility and place of employment, imagine that you were in the position to hire a graduate of the ITM program. Please share the need for specific skill areas are required at your firm.**

	Not Needed	Somewhat Needed	Greatly Needed	Does Not Apply
Professional Certification				
Seek technical references				
Problem Solving/Decision Making				
Quality Improvement Initiatives				
Perform economic analyses				
Productivity Improvement				
Improve industrial systems				
Effective Communication				
Leadership/Project Management				
Effective Teamwork				
Management Skills				
International Enterprises & Strategy				
Personal Growth & Assessment				
Citizenship & Professionalism				
Computer Aided Design & Drafting				
General Automation Technologies				
Lean Manufacturing Methods				
Management Fundamentals				
Emerging Topics in Management				
Project Management				
ISO/TS/QS Certification				
Statistics & Statistical Methods				
Manufacturing Processes				
Manufacturing Improvement Methods				
Engineering Economics				
Operations Management				
Other				

Please Specify:

Q3 What do you see as the strengths of the ITM program?

Q4 What qualities/skills (if any) do you feel are lacking in graduates of the ITM program?

Q5 What do you see as areas needing improvement or more extensive coverage in the program?

Q6 Could you identify/share a few emerging trends or directions where the program should focus efforts to better prepare graduates for the workforce?

Q7 Please provide comments & suggestions that would help to better prepare future graduates.

APPENDIX 2-A
ITM APR Alumni Survey Results

Prepared by: Institutional Research & Testing, 04/09
Statistics

	N		Mean	Median	Std. Deviation
	Valid	Missing	Valid	Missing	Valid
q1a Adequate skills: Professional certification	17	0	3.41	3.00	.618
q1b Need: Professional certification	16	1	3.06	3.00	.929
q1c Adequate skills: Locating credible references	17	0	3.41	4.00	.795
q1d Need: Using credible sources	17	0	3.29	3.00	.686
q1e Adequate skills: Problem solving	17	0	3.41	4.00	.795
q1f Need: Problem solving	17	0	3.82	4.00	.529
q1g Adequate skills: Quality improvement initiatives	17	0	3.71	4.00	.588
q1h Need: Quality tools	17	0	3.65	4.00	.606
q1i Adequate skills: Making economic decisions	17	0	3.35	3.00	.786
q1j Need: Making economic decisions	17	0	3.53	4.00	.624
q1k Adequate skills: Improving productivity	17	0	3.59	4.00	.618
q1l Need: Improving productivity	17	0	3.65	4.00	.606
q1m Adequate skills: Communicating effectively	17	0	3.71	4.00	.470
q1n Use significant forms of communication	17	0	3.71	4.00	.588
q1o Adequate skills: Assuming leadership role	17	0	3.35	4.00	.931
q1p Need: Project management & leadership	17	0	3.53	4.00	.624
q1q Adequate skills: Recognizing/improving team dynamics	17	0	3.41	4.00	.712
q1r Need: Teamwork	17	0	3.53	4.00	.717
q1s Adequate skills: Management role	17	0	3.41	4.00	.795
q1t Need: Management skills	17	0	3.41	4.00	.795
q1u Adequate skills: Recognizing unique challenges of global enterprises	17	0	3.24	3.00	.831
q1v Need: Global enterprise knowledge	17	0	2.94	3.00	.966
q1w Adequate skills: Further professional development	17	0	3.65	4.00	.606
q1x Need: Continued professional development	17	0	3.47	4.00	.624
q1y Adequate skills: Professionalism & citizenship	17	0	3.59	4.00	.618
q1z Need: Citizenship & professionalism	17	0	3.47	4.00	.624
q2 Serve on Advisory Panel	17	0	1.29	1.00	.470
q3 Have professional certification	17	0	1.76	2.00	.437
q4 Professional certifications	17	0			
q5 Perform better than peers	17	0			
q6 Best course & why	17	0			
q7 Worst course & why	17	0			
q8 Best instructor & why	17	0			
q9 Overall expertise & value of instructors	17	0			
q10 Wish had done more	17	0			
q11 Wish had done less	17	0			
q12 Likelihood would enroll again	17	0			
q13 Obtain/retain employment 6 mos. out	16	1	1.13	1.00	.342
q14 Current job title	17	0			

q15 Employer name, City, State	17	0			
q16 Immediate supervisor's name	17	0			
q17 Immediate supervisor's email address	17	0			
q18 Attended graduate school	17	0	1.82	2.00	.393
q19 Intend to enroll in graduate school	15	2	1.27	1.00	.458
q20 Where	17	0			
q21 Program of study	17	0			
q22 Year received degree	17	0	2.29	2.00	.686
q23 Salary	16	1	3.94	4.00	1.063
q24 How long in position	17	0			
q25 Number of years working in this industry	17	0			
q26 Gender	17	0	1.12	1.00	.332
q27 Race	16	1	5.31	5.00	.873
q28 Additional comments/suggestions	17	0			

Frequency Table

q1a Adequate skills: Professional certification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	1	5.9	5.9	5.9
	Somewhat Agree	8	47.1	47.1	52.9
	Strongly Agree	8	47.1	47.1	100.0
	Total	17	100.0	100.0	

q1b Need: Professional certification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	5.9	6.3	6.3
	Somewhat Disagree	3	17.6	18.8	25.0
	Somewhat Agree	6	35.3	37.5	62.5
	Strongly Agree	6	35.3	37.5	100.0
	Total	16	94.1	100.0	
Missing	System	1	5.9		
Total		17	100.0		

APPENDIX 2-A
ITM APR Alumni Survey Results

q1c Adequate skills: Locating credible references

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	*1*	*5.9*	*5.9*	*5.9*
	Somewhat Agree	*7*	*41.2*	*41.2*	*47.1*
	Strongly Agree	*9*	*52.9*	*52.9*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q1d Need: Using credible sources

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	*2*	*11.8*	*11.8*	*11.8*
	Somewhat Agree	*8*	*47.1*	*47.1*	*58.8*
	Strongly Agree	*7*	*41.2*	*41.2*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q1e Adequate skills: Problem solving

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	*1*	*5.9*	*5.9*	*5.9*
	Somewhat Agree	*7*	*41.2*	*41.2*	*47.1*
	Strongly Agree	*9*	*52.9*	*52.9*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q1f Need: Problem solving

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	*1*	*5.9*	*5.9*	*5.9*
	Somewhat Agree	*1*	*5.9*	*5.9*	*11.8*
	Strongly Agree	*15*	*88.2*	*88.2*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q1g Adequate skills: Quality improvement initiatives

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	*1*	*5.9*	*5.9*	*5.9*
	Somewhat Agree	*3*	*17.6*	*17.6*	*23.5*
	Strongly Agree	*13*	*76.5*	*76.5*	*100.0*
	Total	*17*	*100.0*	*100.0*	

APPENDIX 2-A
ITM APR Alumni Survey Results

q1h Need: Quality tools

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	1	5.9	5.9	5.9
	Somewhat Agree	4	23.5	23.5	29.4
	Strongly Agree	12	70.6	70.6	100.0
	Total	17	100.0	100.0	

q1i Adequate skills: Making economic decisions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	5.9	5.9	5.9
	Somewhat Agree	8	47.1	47.1	52.9
	Strongly Agree	8	47.1	47.1	100.0
	Total	17	100.0	100.0	

q1j Need: Making economic decisions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	1	5.9	5.9	5.9
	Somewhat Agree	6	35.3	35.3	41.2
	Strongly Agree	10	58.8	58.8	100.0
	Total	17	100.0	100.0	

q1k Adequate skills: Improving productivity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	1	5.9	5.9	5.9
	Somewhat Agree	5	29.4	29.4	35.3
	Strongly Agree	11	64.7	64.7	100.0
	Total	17	100.0	100.0	

q1l Need: Improving productivity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	1	5.9	5.9	5.9
	Somewhat Agree	4	23.5	23.5	29.4
	Strongly Agree	12	70.6	70.6	100.0
	Total	17	100.0	100.0	

APPENDIX 2-A
ITM APR Alumni Survey Results

q1m Adequate skills: Communicating effectively

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Agree	5	29.4	29.4	29.4
	Strongly Agree	12	70.6	70.6	100.0
	Total	17	100.0	100.0	

q1n Use significant forms of communication

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	1	5.9	5.9	5.9
	Somewhat Agree	3	17.6	17.6	23.5
	Strongly Agree	13	76.5	76.5	100.0
	Total	17	100.0	100.0	

q1o Adequate skills: Assuming leadership role

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	5.9	5.9	5.9
	Somewhat Disagree	2	11.8	11.8	17.6
	Somewhat Agree	4	23.5	23.5	41.2
	Strongly Agree	10	58.8	58.8	100.0
	Total	17	100.0	100.0	

q1p Need: Project management & leadership

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	1	5.9	5.9	5.9
	Somewhat Agree	6	35.3	35.3	41.2
	Strongly Agree	10	58.8	58.8	100.0
	Total	17	100.0	100.0	

q1q Adequate skills: Recognizing/improving team dynamics

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	2	11.8	11.8	11.8
	Somewhat Agree	6	35.3	35.3	47.1
	Strongly Agree	9	52.9	52.9	100.0
	Total	17	100.0	100.0	

APPENDIX 2-A
ITM APR Alumni Survey Results

q1r Need: Teamwork

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	*2*	*11.8*	*11.8*	*11.8*
	Somewhat Agree	*4*	*23.5*	*23.5*	*35.3*
	Strongly Agree	*11*	*64.7*	*64.7*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q1s Adequate skills: Management role

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	*1*	*5.9*	*5.9*	*5.9*
	Somewhat Agree	*7*	*41.2*	*41.2*	*47.1*
	Strongly Agree	*9*	*52.9*	*52.9*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q1t Need: Management skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	*3*	*17.6*	*17.6*	*17.6*
	Somewhat Agree	*4*	*23.5*	*23.5*	*41.2*
	Strongly Agree	*10*	*58.8*	*58.8*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q1u Adequate skills: Recognizing unique challenges of global enterprises

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	*1*	*5.9*	*5.9*	*5.9*
	Somewhat Disagree	*1*	*5.9*	*5.9*	*11.8*
	Somewhat Agree	*8*	*47.1*	*47.1*	*58.8*
	Strongly Agree	*7*	*41.2*	*41.2*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q1v Need: Global enterprise knowledge

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	*1*	*5.9*	*5.9*	*5.9*
	Somewhat Disagree	*5*	*29.4*	*29.4*	*35.3*
	Somewhat Agree	*5*	*29.4*	*29.4*	*64.7*
	Strongly Agree	*6*	*35.3*	*35.3*	*100.0*
	Total	*17*	*100.0*	*100.0*	

APPENDIX 2-A
ITM APR Alumni Survey Results

q1w Adequate skills: Further professional development

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	*1*	*5.9*	*5.9*	*5.9*
	Somewhat Agree	*4*	*23.5*	*23.5*	*29.4*
	Strongly Agree	*12*	*70.6*	*70.6*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q1x Need: Continued professional development

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	*1*	*5.9*	*5.9*	*5.9*
	Somewhat Agree	*7*	*41.2*	*41.2*	*47.1*
	Strongly Agree	*9*	*52.9*	*52.9*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q1y Adequate skills: Professionalism & citizenship

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	*1*	*5.9*	*5.9*	*5.9*
	Somewhat Agree	*5*	*29.4*	*29.4*	*35.3*
	Strongly Agree	*11*	*64.7*	*64.7*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q1z Need: Citizenship & professionalism

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	*1*	*5.9*	*5.9*	*5.9*
	Somewhat Agree	*7*	*41.2*	*41.2*	*47.1*
	Strongly Agree	*9*	*52.9*	*52.9*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q2 Serve on Advisory Panel

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	*12*	*70.6*	*70.6*	*70.6*
	No	*5*	*29.4*	*29.4*	*100.0*
	Total	*17*	*100.0*	*100.0*	

APPENDIX 2-A
ITM APR Alumni Survey Results

q3 Have professional certification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	*4*	*23.5*	*23.5*	*23.5*
	No	*13*	*76.5*	*76.5*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q4 Professional certifications

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		*13*	*76.5*	*76.5*	*76.5*
	First Class Refrigeration License Chief Engineers License	*1*	*5.9*	*5.9*	*82.4*
	I have the following certifications from American Society for Quality Certified Quality Engineer Certified Calibration ?Technician Certified Quality Technician	*1*	*5.9*	*5.9*	*88.2*
	I will be taking the certification exam to become a PMP (project management professional) this summer	*1*	*5.9*	*5.9*	*94.1*
	journeyman pattern maker	*1*	*5.9*	*5.9*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q5 Perform better than peers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		*2*	*11.8*	*11.8*	*11.8*
	Better because of my ITM background and training I received at Ferris.	*1*	*5.9*	*5.9*	*17.6*
	Better in most things due to personal drive.	*1*	*5.9*	*5.9*	*23.5*
	Better in some areas and worse in others since we all have different backgrounds and skill sets.	*1*	*5.9*	*5.9*	*29.4*
	Better, due to continuing education, and a solid base of knowledge.	*1*	*5.9*	*5.9*	*35.3*
	Better, due to diversification of this Degree program.	*1*	*5.9*	*5.9*	*41.2*
	Better, I have a global outlook on how and why a company make decisions	*1*	*5.9*	*5.9*	*47.1*
	Currently, I am not in a position that would allow for an accurate response.	*1*	*5.9*	*5.9*	*52.9*
	I believe that I perform better than my peers due to the fact that I have more knowledge in the field and I am able to apply it to my work.	*1*	*5.9*	*5.9*	*58.8*
	I believe that I perform better because of my communication skills.	*1*	*5.9*	*5.9*	*64.7*
	I feel that I have skills that will help me for the rest of my career.	*1*	*5.9*	*5.9*	*70.6*
	I perform as well as any of my peers do in the electrical assembly department. We may be somewhat unique though due to the large variations in what our specialties include. In other words even though 3 of us have the title of Industrial Engineer, we all perform very unique jobs form one another.	*1*	*5.9*	*5.9*	*76.5*
	I perform better because of my professional attitude	*1*	*5.9*	*5.9*	*82.4*

	I perform better because what I learned in the ITM is pertinent to my current job.	*1*	*5.9*	*5.9*	*88.2*
	I personally feel that I perform better than most of my professional peers. In the nine years that I have been employed at Nissan Technical Center North America, I have been promoted twice and I have received a better than average score on every one of my yearly reviews. I feel strongly that my ability to perform at a high level is directly related to the education I received at Henry Ford Community College and at Ferris State University (CAD and Industrial Technology Management).	*1*	*5.9*	*5.9*	*94.1*
	It is difficult to compare as I work for a small company with few at my level. I would say that I am at least equal and probably better than at least one on my level.	*1*	*5.9*	*5.9*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q6 Best course & why

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		*3*	*17.6*	*17.6*	*17.6*
	Apps 401 - case studies and global issues, also MGMT 370 for common decision making calculations	*1*	*5.9*	*5.9*	*23.5*
	APPS 401 Issues Industrial Management We covered a lot of topics in this class. It opened my eyes to the different problems and perspectives in a ever changing and now global economy.	*1*	*5.9*	*5.9*	*29.4*
	APPS490 WMA MANUFACTURING IMPROVEMENT MANAGEMENT The use of lean manufacturing comes up almost every day at work and having knowledgeable input gives my company an advantage in becoming successful.	*1*	*5.9*	*5.9*	*35.3*
	Capstone was the best course in the program. it was a culmination of everything that we learned and we were able to apply those things to real life situation. It also allowed for real life situations of meeting deadlines, tracking progress and seeing an outcome. I was intimidated by this course at first, but in the end it truly is a great way to reinforce the lessons that we had learned.	*1*	*5.9*	*5.9*	*41.2*
	Forgive me for not recalling the exact name of the class but the most advantageous to me was the Program Management class (taught by Professor Purvis). Gant charts, timing and costing of programs is critical in today's assembly environment especially considering how fast product must get to market and be of exceptional quality.	*1*	*5.9*	*5.9*	*47.1*
	I feel that the best course was the Final Project course. It brought all of the other courses together and showed how they interact.	*1*	*5.9*	*5.9*	*52.9*
	I would have a hard time saying which was the best as there were a number of classes that were very informative and helped with needed technical or managerial skills.	*1*	*5.9*	*5.9*	*58.8*

	In my opinion, the best courses in the ITM program were as follows: APPS 351 Production Flow and Plant Layout (3 credits) APPS 450 Manufacturing Improvement Management (3 credits) I feel that these courses were the best because they taught me the importance of lean manufacturing. I can't express how fortunate I am to have had the opportunity to take these courses. I'm constantly analyzing processes and procedures at work, keeping the things that I learned in these two courses in the back of my mind. For example, just recently I was given the assignment to map the "current state" of one of our processes. Upon completion of the project it was determined that we were not using an efficient process mainly because we weren't optimizing our resources.	1	5.9	5.9	64.7
	Lean Management, I enjoyed the class because we were able to apply it directly to our personal job. The instructor made the class very interesting.	1	5.9	5.9	70.6
	Lean manufacturing was by far the best class in the program. It dealt with issues that are relevant in today's economic times	1	5.9	5.9	76.5
	Operations Management and Lean Plant Layouts.	1	5.9	5.9	82.4
	Quality Functional Deployment because it applicable in every industry.	1	5.9	5.9	88.2
	Quality Management--the instructor was engaging and interacted with the students well.	1	5.9	5.9	94.1
	The final project course.	1	5.9	5.9	100.0
	Total	17	100.0	100.0	

q7 Worst course & why

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		5	29.4	29.4	29.4
	352 Design for Manufacturing, most students were in manufacturing already	1	5.9	5.9	35.3
	Economics, by far the worst teacher in my entire academic career!	1	5.9	5.9	41.2
	Engineering Fundamentals--the instructor was more interested in other areas not related to engineering principles.	1	5.9	5.9	47.1
	For my type of job/employment the MFGE 341 and 342 where good information but not relevant enough to justify 2 semesters of hard work. I think a good stats/math/business math overview would be more appropriate and beneficial.	1	5.9	5.9	52.9
	I feel that all of the required courses had some value. If I have to pick 1 it would be APPS 350 only because of the instructor.	1	5.9	5.9	58.8
	I found the course on robotics was the least helpful mainly due to the instructor we had. I am sure that it could be improved even with a better instructor.	1	5.9	5.9	64.7
	none	1	5.9	5.9	70.6
	Technical Writing	1	5.9	5.9	76.5
	the basic electricity class. It was taken out of the program after my class took it.	1	5.9	5.9	82.4

	The class that had the least amount of benefit to me was the Design for Manufacturing class. This by no means was the fault of the instructor teaching the class, he obviously loved what he taught and was very good at teaching it. The class however dealt solely on the processing of metals which does not help the people who, like me, are involved in field that does not require metal processing. I would have liked to see the class cover a broader scope of manufacturing and how to make a product manufacturing friendly. The class did cover this, but once again only for metal processing.	*1*	*5.9*	*5.9*	*88.2*
	The course that revolved around ISO and ISO 14001 was in my opinion the worst course. This is due more to the instructor rather than the material being studied. The course expectations were a living document that changed at any given moment. This was just frustrating as a student as you were never sure what might change at any given point in time.	*1*	*5.9*	*5.9*	*94.1*
	The worst class the program had to offer was MFGE 313, Computer Applications for Manufacturing Engineers (3 credits). In my opinion, the class was the worst because the fundamentals of the course focused on the elementary uses of a computer. Basically, the objectives being taught to us in that class were something that we had all learned in high school. I must admit, the faculty at Ferris State quickly detected and resolved the problem.	*1*	*5.9*	*5.9*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q8 Best instructor & why

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		*3*	*17.6*	*17.6*	*17.6*
	It would not be fair to pick out a single instructor. I would have to say Professor Purvis was instrumental for my development as well as the programs. He gave us his real-world experiences while also giving our program a leader which it desperately needed. I must also pay high regard to professor Rusco, who by far was the most challenging professor I have ever had at any of the colleges or universities I have attended. Very challenging, but fair. Both of these two teach with a passion, which is noticeable in their classrooms.	*1*	*5.9*	*5.9*	*23.5*
	Joe Joyce, Steve Lyman, John Mola and Steve Fosgard.	*1*	*5.9*	*5.9*	*29.4*
	John F Mola Sean Goffnet But of them Have through knowledge and know what they are talking about.	*1*	*5.9*	*5.9*	*35.3*
	John Mola, because he gave the best real life comparisons.	*1*	*5.9*	*5.9*	*41.2*
	Ken Clark and Steve Landenberg. They both had real world experience and were able to pass that on effectively.	*1*	*5.9*	*5.9*	*47.1*
	Mr. Moga; he made things interesting, worked with you if you had problems, had layman's terms and examples so you understood, very professional	*1*	*5.9*	*5.9*	*52.9*
	Mr. Mola, based on his enthusiasm, knowledge and interest in the students success.	*1*	*5.9*	*5.9*	*58.8*
	Mr. Sean Goffnett--He always attempted to see the students concerns from their point of view and always was available for discussion.	*1*	*5.9*	*5.9*	*64.7*
	Purvis did a good job for what was asked of him. He had a lot of different courses to prepare for that were relatively new.	*1*	*5.9*	*5.9*	*70.6*

	Sean Goffnet His teaching style. He related real world applications. He seemed to care that you actually learned something and took the time to teach.	*1*	*5.9*	*5.9*	*76.5*
	Sean Goffnet was by far the best instructor in the program. He used the classroom and technology to effectively communicate the subjects he was teaching. He also was willing to answer questions and help when necessary.	*1*	*5.9*	*5.9*	*82.4*
	Sean was the best instructor hand down. He was capable of presenting the material in a way that any student was able to comprehend it.	*1*	*5.9*	*5.9*	*88.2*
	Steve Landenberger as he was able to teach the subjects and help apply it to different manufacturing issues.	*1*	*5.9*	*5.9*	*94.1*
	The best instructor to teach within the ITM program was John Mola. There is no argument in my mind that he was the best. He not only understood the material (book smart) but he could provide us with real time examples of how to implement what he was teaching in the real world and why it was important (street smart). I'll tell you this… I was promoted to another position last year and I owe a large part of that to John. Why? Because he instilled in me the confidence I needed to tackle my career goals. I'm no longer intimidated when it comes to taking on new things within my job and because of that I'm apt to learn new things at a faster pace. Lastly, I forget his name but I also thought the teacher that taught APPS 401 was extremely knowledgeable and helpful. I remember that course being held early on in the curriculum and that the instructor was the first to challenge us during discussions and through the homework he assigned. He was excellent. He had a lot of experience and he always welcomed our opinions. I confidently feel that I walked out of that class a better person.	*1*	*5.9*	*5.9*	*100.0*
	Total	*17*	*100.0*	*100.0*	

q9 Overall expertise & value of instructors

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		*3*	*17.6*	*17.6*	*17.6*
	Excellent	*1*	*5.9*	*5.9*	*23.5*
	For the most part all instructors were well versed in the subject matter	*1*	*5.9*	*5.9*	*29.4*
	Good	*1*	*5.9*	*5.9*	*35.3*
	I feel that most instructors were very knowledgeable and were able to relate the information to real manufacturing.	*1*	*5.9*	*5.9*	*41.2*
	I held their opinions and teachings in high regard because of their industry experience.	*1*	*5.9*	*5.9*	*47.1*
	Most if the instructors were very knowledgeable and were informative. The problem was that there were a couple instructors that were difficult to understand and follow.	*1*	*5.9*	*5.9*	*52.9*
	Most instructors were very good with the exception of one.	*1*	*5.9*	*5.9*	*58.8*
	Most of the instructors have on the job real world experience. This is a bonus when an instructor can add expertise and can apply it to the topics being taught.	*1*	*5.9*	*5.9*	*64.7*
	Of all the classes that I took only 2 instructors didn't fully meet my expectations. That's not bad.	*1*	*5.9*	*5.9*	*70.6*

		Frequency	Percent	Valid Percent	Cumulative Percent
	Only one instructor made the experience bad for me. I understand he was not asked to return	1	5.9	5.9	76.5
	Overall, I was satisfied with the instructors that FSU provided.	1	5.9	5.9	82.4
	This program had only two instructors that left a positive impression based on their professionalism and abilities.	1	5.9	5.9	88.2
	Very good	1	5.9	5.9	94.1
	Very solid program, helped two of the students I know who were in it land jobs.	1	5.9	5.9	100.0
	Total	17	100.0	100.0	

q10 Wish had done more

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		4	23.5	23.5	23.5
	Basic Engineering Classes	1	5.9	5.9	29.4
	Ergonomics training.	1	5.9	5.9	35.3
	I wish we could have had more line walks. Don’t get me wrong, the line walks we attended were great, I just wish we could have gone to a few more.	1	5.9	5.9	41.2
	I wish we had done more management and people skills as opposed to the constant barrage of Quality Management.	1	5.9	5.9	47.1
	in focusing on the specifics of the class content and the use of more real-world examples.	1	5.9	5.9	52.9
	management classes in junior college	1	5.9	5.9	58.8
	Management of people and materials. Labor relations/law to assist the new young manager.	1	5.9	5.9	64.7
	on campus classes	1	5.9	5.9	70.6
	Personal and human resource skills	1	5.9	5.9	76.5
	Plant tours. We did so many, but they seem to be the one thing that sticks in my mind. Going out and seeing what other companies do and having those references is priceless.	1	5.9	5.9	82.4
	practical experience exercises. Most of the students already work and if those problems or situations could be brought into the classroom for analysis it would be invaluable.	1	5.9	5.9	88.2
	The Engineering Economics class was a two credit course offered during a summer session. That class should be expanded as it is, in my opinion one of more useful topics. Especially in these economic times.	1	5.9	5.9	94.1
	with mathematics. Engineering economics was a good class but more applied mathematics would better.	1	5.9	5.9	100.0
	Total	17	100.0	100.0	

q11 Wish had done less

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		4	23.5	23.5	23.5
	can't think of anything, Sorry	1	5.9	5.9	29.4
	chemistry	1	5.9	5.9	35.3

	elementary factory mechanical studies as most of us were journeyman trades labor already	1	5.9	5.9	41.2
	I can't think of anything	1	5.9	5.9	47.1
	I do not have anything that we should have done less of.	1	5.9	5.9	52.9
	I wish we could have done more "hands on" work during the time I attended the Automation class. The class was entirely based off of lecture.	1	5.9	5.9	58.8
	I wish we done less on Quality Management. There were 3-4 semesters where many of the topics were overlapping each other and I did not necessarily learn anything new.	1	5.9	5.9	64.7
	in terms, of spending time discussing areas that were not related to the class content	1	5.9	5.9	70.6
	Lean thinking	1	5.9	5.9	76.5
	online classes	1	5.9	5.9	82.4
	The emphasis on the global economy although interesting was not necessary.	1	5.9	5.9	88.2
	Traveling, move the campus closer to Holland.	1	5.9	5.9	94.1
	with quality topics. Some of the classes seemed to be repetitive.	1	5.9	5.9	100.0
	Total	17	100.0	100.0	

q12 Likelihood would enroll again

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		5	29.4	29.4	29.4
	I have recommended the ITM program to several of my peers. Although some slight changes would be helpful, overall I feel the program is worthwhile.	1	5.9	5.9	35.3
	I needed 4 year degree to advance any further. Electric Engineering is almost impossible to obtain taking night classes. Ferris doesn't have EET in Grand Rapids so this was the most reasonable alternative.	1	5.9	5.9	41.2
	I would - this program offers a versatile education that could be adjusted for an individual to work just about anywhere in manufacturing.	1	5.9	5.9	47.1
	I would enroll again because of the connection with HFCC and the proximity of the classes being very close to home. I would and have recommended the program to others	1	5.9	5.9	52.9
	I would enroll again if I had to. I would prefer to be in different employment 1st and apply this knowledge in a field that I don't have 20+ years of experience in.	1	5.9	5.9	58.8
	I would enroll in this program again at anytime. I feel it was a well rounded course but it can always have improvements.	1	5.9	5.9	64.7
	I would enroll in this program again.	1	5.9	5.9	70.6
	is extremely high because of the possibilities this degree has given me.	1	5.9	5.9	76.5
	knowing what I know now, I would likely enroll in this program again. The problems that arose were likely due to being a part of the first cohort for this program. I would imagine some the bugs were identified and addressed for upcoming cohorts. I believe the program has benefit.	1	5.9	5.9	82.4

	Negative, it appeared that the adjunct instructors were concerned with covering all of the materials; instead of, ensuring that students had a reasonable understanding and application ability of the ideas and content of the materials presented	1	5.9	5.9	88.2
	Yes, I learned a lot, Good people who wanted to be there to learn.	1	5.9	5.9	94.1
	Yes, I would enroll again. It was a good program, not full of a bunch of fluff but actual real world applications.	1	5.9	5.9	100.0
	Total	17	100.0	100.0	

q13 Obtain/retain employment 6 mos. out

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	14	82.4	87.5	87.5
	No	2	11.8	12.5	100.0
	Total	16	94.1	100.0	
Missing	System	1	5.9		
Total		17	100.0		

q14 Current job title

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		4	23.5	23.5	23.5
	Associate Engineer II	1	5.9	5.9	29.4
	Building Engineer	1	5.9	5.9	35.3
	Chief Powerhouse Stationary Engineer	1	5.9	5.9	41.2
	CMMS Coordinator	1	5.9	5.9	47.1
	Consultant - out of state on a 30 day contract due to current economic conditions in Michigan.	1	5.9	5.9	52.9
	Department Operations Manager	1	5.9	5.9	58.8
	Electric Engineering Supervisor	1	5.9	5.9	64.7
	Fabrication Manager	1	5.9	5.9	70.6
	Gage Technician	1	5.9	5.9	76.5
	Industrial Engineer	1	5.9	5.9	82.4
	Pattern Maker	1	5.9	5.9	88.2
	Process Engineer/Programmer	1	5.9	5.9	94.1
	Salesman	1	5.9	5.9	100.0
	Total	17	100.0	100.0	

q15 Employer name, City, State

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		4	23.5	23.5	23.5
	Anderson Global 500 W. Sherman Muskegon HTS 49444	1	5.9	5.9	29.4
	CBS Boring & Machine Fraser, MI	1	5.9	5.9	35.3
	Dearborn Public Schools	1	5.9	5.9	41.2
	Dearborn Public Schools, Dearborn Mi.	1	5.9	5.9	47.1

	FB Wright Co Dearborn, MI	1	5.9	5.9	52.9
	Fisher Dynamics Corp. St. Clair Shores, Mi.	1	5.9	5.9	58.8
	Holland Board of Public Works 625 Hastings Ave Holland, MI 49423	1	5.9	5.9	64.7
	Intertek, Grand Rapids, MI	1	5.9	5.9	70.6
	Laid off from: Concept Industries 4950 Kraft Ave SE Grand Rapids, MI 49502	1	5.9	5.9	76.5
	Nissan Technical Center North America (NTCNA), Farmington Hills, MI	1	5.9	5.9	82.4
	Premier MSS, Trenton, MI	1	5.9	5.9	88.2
	Southwestern Industries, Rancho Dominguez, CA	1	5.9	5.9	94.1
	The Gentex Corporation	1	5.9	5.9	100.0
	Total	17	100.0	100.0	

q16 Immediate supervisor's name

		Frequency	Percent	Valid Percent	Cumulative Percent
	DATA OMITTED FROM REPORTING				

q17 Immediate supervisor's email address

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DATA OMITTED FROM REPORTING				

q18 Attended graduate school

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	3	17.6	17.6	17.6
	No	14	82.4	82.4	100.0
	Total	17	100.0	100.0	

q19 Intend to enroll in graduate school

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	11	64.7	73.3	73.3
	No	4	23.5	26.7	100.0
	Total	15	88.2	100.0	
Missing	System	2	11.8		
Total		17	100.0		

APPENDIX 2-A
ITM APR Alumni Survey Results

q20 Where

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		9	52.9	52.9	52.9
	don't know	1	5.9	5.9	58.8
	FSU	2	11.8	11.8	70.6
	FSU if possible	1	5.9	5.9	76.5
	Michigan, Virginia	1	5.9	5.9	82.4
	Muskegon	1	5.9	5.9	88.2
	To be determined	1	5.9	5.9	94.1
	University of Michigan (Dearborn)	1	5.9	5.9	100.0
	Total	17	100.0	100.0	

q21 Program of study

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		9	52.9	52.9	52.9
	Business Management, but I would take masters in Industrial Engineering if offered.	1	5.9	5.9	58.8
	Facilities Management or teaching in a trade school setting	1	5.9	5.9	64.7
	have not determined	1	5.9	5.9	70.6
	imt	1	5.9	5.9	76.5
	MBA	3	17.6	17.6	94.1
	MBA/ASQM	1	5.9	5.9	100.0
	Total	17	100.0	100.0	

q22 Year received degree

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2006	2	11.8	11.8	11.8
	2007	8	47.1	47.1	58.8
	2008	7	41.2	41.2	100.0
	Total	17	100.0	100.0	

q23 Salary

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	$20,001-$39,999	1	5.9	6.3	6.3
	$40,000-$59,999	3	17.6	18.8	25.0
	$60,000-$79,999	10	58.8	62.5	87.5
	$80,000-$99,999	1	5.9	6.3	93.8
	Not Applicable	1	5.9	6.3	100.0
	Total	16	94.1	100.0	
Missing	System	1	5.9		
Total		17	100.0		

q24 How long in position

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		16	94.1	94.1	94.1
	1	1	5.9	5.9	100.0
	Total	17	100.0	100.0	

q25 Number of years working in this industry

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		2	11.8	11.8	11.8
	10 years	1	5.9	5.9	17.6
	14 mo	1	5.9	5.9	23.5
	19 years	1	5.9	5.9	29.4
	2 years	1	5.9	5.9	35.3
	20	1	5.9	5.9	41.2
	20 years	1	5.9	5.9	47.1
	20+	1	5.9	5.9	52.9
	26yr	1	5.9	5.9	58.8
	3	1	5.9	5.9	64.7
	30 years	1	5.9	5.9	70.6
	31	1	5.9	5.9	76.5
	8	1	5.9	5.9	82.4
	8 months	1	5.9	5.9	88.2
	8 years	1	5.9	5.9	94.1
	9 Years	1	5.9	5.9	100.0
	Total	17	100.0	100.0	

q26 Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	15	88.2	88.2	88.2
	Female	2	11.8	11.8	100.0
	Total	17	100.0	100.0	

q27 Race

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Caucasian-American/White	14	82.4	87.5	87.5
	Other	1	5.9	6.3	93.8
	Prefer not to respond	1	5.9	6.3	100.0
	Total	16	94.1	100.0	
Missing	System	1	5.9		
Total		17	100.0		

q28 Additional comments/suggestions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		16	94.1	94.1	94.1
	I think this is a good program. Due to the current economics and unemployment in Michigan I have been unable to apply this education the way that I had planned. I was hoping to advance at my current place of employment or find a new job. Neither has happened so far.	1	5.9	5.9	100.0
	Total	17	100.0	100.0	

APPENDIX 2-B
ITM APR Employers of Alumni Survey Results

Frequencies

Prepared by: Institutional Research & Testing, 06/09

Statistics

	N		Mean	Median	Std. Deviation
	Valid	Missing	Valid	Missing	Valid
q1 How many employees at your facility	2	0	3.50	3.50	2.121
q2a Primary activity: Welding Equipment	2	0	.00	.00	.000
q2b Primary activity: Robotics & Automation	2	0	.00	.00	.000
q2c Primary activity: Manufacturing & Fabrication	2	0	.00	.00	.000
q2d Primary activity: Consulting	2	0	.00	.00	.000
q2e Primary activity: Construction	2	0	.00	.00	.000
q2f Primary activity: Automotive	2	0	.00	.00	.000
q2g Primary activity: Agricultural/Construction Equipment	2	0	.00	.00	.000
q2h Primary activity: Aerospace/Shipbuilding	2	0	.00	.00	.000
q2i Primary activity: Other	2	0	1.00	1.00	.000
q2j Primary activity: Other specified	2	0			
q3 Currently have 1 or more FSU ITM grads	2	0	1.00	1.00	.000
q4 How prepared was/were FSU grads	2	0	3.00	3.00	.000
q5 Comments about preparedness of grads	2	0			
q6a Professional Certification	2	0	2.50	2.50	.707
q6b Seek technical references	2	0	2.50	2.50	.707
q6c Problem Solving/Decision Making	2	0	3.00	3.00	.000
q6d Quality Improvement Initiatives	2	0	3.00	3.00	.000
q6e Perform economic analyses	2	0	2.00	2.00	.000
q6f Productivity Improvement	2	0	2.00	2.00	.000
q6g Improve industrial systems	2	0	2.00	2.00	.000
q6h Effective communication	2	0	3.00	3.00	.000
q6i Leadership/Project Management	2	0	3.00	3.00	.000
q6j Effective teamwork	2	0	3.00	3.00	.000
q6k Management skills	2	0	2.50	2.50	.707
q6l International Enterprises & Strategy	2	0	1.00	1.00	.000
q6m Personal growth & assessment	2	0	3.00	3.00	.000
q6n Citizenship & professionalism	2	0	3.00	3.00	.000
q7a Computer Aided Design & Drafting	2	0	3.00	3.00	.000
q7b General Automation Technologies	2	0	2.50	2.50	.707
q7c Lean Manufacturing Methods	2	0	1.50	1.50	.707
q7d Management Fundamentals	2	0	3.50	3.50	.707
q7e Emerging Topics in Management	2	0	3.00	3.00	1.414
q7f Project Management	2	0	4.00	4.00	.000
q7g ISO/TS/QS Certification	2	0	1.00	1.00	.000
q7h Statistics & Statistical Methods	2	0	2.00	2.00	1.414
q7i Manufacturing Processes	2	0	1.50	1.50	.707

q7j Manufacturing Improvement Methods	2	0	1.50	1.50	.707
q7k Engineering Economics	2	0	2.00	2.00	1.414
q7l Operations Management	2	0	2.50	2.50	.707
q7m Other	0	2			
q7n Other needs specified	2	0			
q8a Prepares students to enter industry better than other schools	2	0	2.50	2.50	.707
q8b ITM grads contribute as much as grads from other programs	2	0	3.50	3.50	.707
q8c Provides a foundation for multiple career possibilities	2	0	3.00	3.00	.000
q8d Adequate placement assistance is provided to graduates.	1	1	3.00	3.00	
q9 Company experienced difficulty hiring qualified tech mgrs	2	0	1.50	1.50	.707
q10 Best estimate of growth potential for tech mgrs at your company	2	0	1.50	1.50	.707
q11 Degree prefer for tech mgrs	2	0	3.00	3.00	1.414
q12 Additional comments about ITM program	2	0			
q13 Additional general comments	2	0			

Frequency Table

q1 How many employees at your facility

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	50-100	1	50.0	50.0	50.0
	Over 1,000	1	50.0	50.0	100.0
	Total	2	100.0	100.0	

q2a Primary activity: Welding Equipment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Selected	2	100.0	100.0	100.0

q2b Primary activity: Robotics & Automation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Selected	2	100.0	100.0	100.0

q2c Primary activity: Manufacturing & Fabrication

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Selected	2	100.0	100.0	100.0

q2d Primary activity: Consulting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Selected	2	100.0	100.0	100.0

q2e Primary activity: Construction

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Selected	2	100.0	100.0	100.0

q2f Primary activity: Automotive

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Selected	2	100.0	100.0	100.0

q2g Primary activity: Agricultural/Construction Equipment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Selected	2	100.0	100.0	100.0

q2h Primary activity: Aerospace/Shipbuilding

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Selected	2	100.0	100.0	100.0

q2i Primary activity: Other

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Selected	2	100.0	100.0	100.0

q2j Primary activity: Other specified

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	electric utility	1	50.0	50.0	50.0
	Public Schools	1	50.0	50.0	100.0
	Total	2	100.0	100.0	

APPENDIX 2-B
ITM APR Employers of Alumni Survey Results

q3 Currently have 1 or more FSU ITM grads

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	*2*	*100.0*	*100.0*	*100.0*

q4 How prepared was/were FSU grads

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Prepared	*2*	*100.0*	*100.0*	*100.0*

q5 Comments about preparedness of grads

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		*2*	*100.0*	*100.0*	*100.0*

q6a Professional Certification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	*1*	*50.0*	*50.0*	*50.0*
	Greatly Needed	*1*	*50.0*	*50.0*	*100.0*
	Total	*2*	*100.0*	*100.0*	

q6b Seek technical references

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	*1*	*50.0*	*50.0*	*50.0*
	Greatly Needed	*1*	*50.0*	*50.0*	*100.0*
	Total	*2*	*100.0*	*100.0*	

q6c Problem Solving/Decision Making

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Greatly Needed	*2*	*100.0*	*100.0*	*100.0*

q6d Quality Improvement Initiatives

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Greatly Needed	*2*	*100.0*	*100.0*	*100.0*

q6e Perform economic analyses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	*2*	*100.0*	*100.0*	*100.0*

q6f Productivity Improvement

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	*2*	*100.0*	*100.0*	*100.0*

q6g Improve industrial systems

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	*2*	*100.0*	*100.0*	*100.0*

q6h Effective communication

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Greatly Needed	*2*	*100.0*	*100.0*	*100.0*

q6i Leadership/Project Management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Greatly Needed	*2*	*100.0*	*100.0*	*100.0*

q6j Effective teamwork

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Greatly Needed	*2*	*100.0*	*100.0*	*100.0*

q6k Management skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	*1*	*50.0*	*50.0*	*50.0*
	Greatly Needed	*1*	*50.0*	*50.0*	*100.0*
	Total	*2*	*100.0*	*100.0*	

q6l International Enterprises & Strategy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Needed	*2*	*100.0*	*100.0*	*100.0*

q6m Personal growth & assessment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Greatly Needed	*2*	*100.0*	*100.0*	*100.0*

q6n Citizenship & professionalism

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Greatly Needed	*2*	*100.0*	*100.0*	*100.0*

q7a Computer Aided Design & Drafting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat	*2*	*100.0*	*100.0*	*100.0*

q7b General Automation Technologies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Little	*1*	*50.0*	*50.0*	*50.0*
	Somewhat	*1*	*50.0*	*50.0*	*100.0*
	Total	*2*	*100.0*	*100.0*	

q7c Lean Manufacturing Methods

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at All	*1*	*50.0*	*50.0*	*50.0*
	Very Little	*1*	*50.0*	*50.0*	*100.0*
	Total	*2*	*100.0*	*100.0*	

q7d Management Fundamentals

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat	*1*	*50.0*	*50.0*	*50.0*
	To a Great Extent	*1*	*50.0*	*50.0*	*100.0*
	Total	*2*	*100.0*	*100.0*	

q7e Emerging Topics in Management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Little	*1*	*50.0*	*50.0*	*50.0*
	To a Great Extent	*1*	*50.0*	*50.0*	*100.0*
	Total	*2*	*100.0*	*100.0*	

q7f Project Management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	To a Great Extent	*2*	*100.0*	*100.0*	*100.0*

q7g ISO/TS/QS Certification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at All	*2*	*100.0*	*100.0*	*100.0*

q7h Statistics & Statistical Methods

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at All	*1*	*50.0*	*50.0*	*50.0*
	Somewhat	*1*	*50.0*	*50.0*	*100.0*
	Total	*2*	*100.0*	*100.0*	

q7i Manufacturing Processes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at All	*1*	*50.0*	*50.0*	*50.0*
	Very Little	*1*	*50.0*	*50.0*	*100.0*
	Total	*2*	*100.0*	*100.0*	

q7j Manufacturing Improvement Methods

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at All	*1*	*50.0*	*50.0*	*50.0*
	Very Little	*1*	*50.0*	*50.0*	*100.0*
	Total	*2*	*100.0*	*100.0*	

q7k Engineering Economics

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at All	1	50.0	50.0	50.0
	Somewhat	1	50.0	50.0	100.0
	Total	2	100.0	100.0	

q7l Operations Management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very Little	1	50.0	50.0	50.0
	Somewhat	1	50.0	50.0	100.0
	Total	2	100.0	100.0	

q7m Other

		Frequency	Percent
Missing	System	2	100.0

q7n Other needs specified

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		2	100.0	100.0	100.0

q8a Prepares students to enter industry better than other schools

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	1	50.0	50.0	50.0
	Somewhat Agree	1	50.0	50.0	100.0
	Total	2	100.0	100.0	

q8b ITM grads contribute as much as grads from other programs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Agree	1	50.0	50.0	50.0
	Strongly Agree	1	50.0	50.0	100.0
	Total	2	100.0	100.0	

APPENDIX 2-B
ITM APR Employers of Alumni Survey Results

q8c Provides a foundation for multiple career possibilities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Agree	*2*	*100.0*	*100.0*	*100.0*

q8d Adequate placement assistance is provided to graduates.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Agree	*1*	*50.0*	*100.0*	*100.0*
Missing	System	*1*	*50.0*		
Total		*2*	*100.0*		

q9 Company experienced difficulty hiring qualified tech mgrs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	*1*	*50.0*	*50.0*	*50.0*
	No	*1*	*50.0*	*50.0*	*100.0*
	Total	*2*	*100.0*	*100.0*	

q10 Best estimate of growth potential for tech mgrs at your company

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Probable reduction in staff	*1*	*50.0*	*50.0*	*50.0*
	Average/Steady	*1*	*50.0*	*50.0*	*100.0*
	Total	*2*	*100.0*	*100.0*	

q11 Degree prefer for tech mgrs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Engineering	*1*	*50.0*	*50.0*	*50.0*
	No Preference	*1*	*50.0*	*50.0*	*100.0*
	Total	*2*	*100.0*	*100.0*	

q12 Additional comments about ITM program

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		*2*	*100.0*	*100.0*	*100.0*

APPENDIX 2-B
ITM APR Employers of Alumni Survey Results

q13 Additional general comments

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		*2*	*100.0*	*100.0*	*100.0*

APPENDIX 2-D
ITM APR Current Student Survey Results

Frequencies

Prepared by: Institutional Research & Testing, 04/09

Statistics

	N		Mean	Median	Std. Deviation
	Valid	Missing	Valid	Missing	Valid
q1a Need for professional certification	29	0	3.17	3.00	.928
q1b Obtaining adequate skills for locating credible sources	29	0	3.10	3.00	.772
q1c Need for seeking & using credible sources of scholarly knowledge	29	0	3.10	3.00	.939
q1d Obtaining adequate skills for problem solving	29	0	3.38	3.00	.728
q1e Need for problem solving	29	0	3.69	4.00	.604
q1f Obtaining adequate skills for contributing to quality improvement	29	0	3.38	4.00	.862
q1g Need for quality tools	29	0	3.34	4.00	.974
q1h Obtaining adequate skills for making economic decisions	29	0	3.03	3.00	.823
q1i Need for making economic decisions	29	0	3.03	3.00	.944
q1j Obtaining adequate skills for improving productivity	28	1	3.50	4.00	.745
q1k Need for improving productivity	29	0	3.55	4.00	.632
q1l Obtaining adequate skills for improving industrial systems	29	0	3.41	4.00	.780
q1m Need for improving industrial systems	29	0	3.41	4.00	.825
q1n Obtaining adequate skills for communicating effectively	29	0	3.45	4.00	.632
q1o Use significant forms of communication	29	0	3.66	4.00	.553
q1p Obtaining adequate skills for assuming leadership role	29	0	3.55	4.00	.632
q1q Need for project mgmt & leadership	29	0	3.48	4.00	.829
q1r Obtaining adequate skills for recognizing/improving team dynamics	28	1	3.32	3.50	.772
q1s Need for teamwork	28	1	3.50	4.00	.694
q1t Obtaining adequate skills for mgmt role	28	1	3.54	4.00	.637
q1u Need for using mgmt skills	28	1	3.46	4.00	.793
q1v Obtaining adequate skills for dealing with global enterprises	28	1	3.29	3.00	.763
q1w Need for global enterprise knowledge	28	1	3.00	3.00	.981
q1x Obtaining adequate skills for further pro development	28	1	3.54	4.00	.693
q1y Need for continued pro development	28	1	3.39	4.00	.832
q1z Obtaining adequate skills in my professionalism & citizenship	28	1	3.29	3.00	.763
q1aa Need for citizenship & professionalism	27	2	3.30	3.00	.724
q2 Professional certification	29	0	1.76	2.00	.435
q3 List certifications	29	0			
q4 Intend to seek professional certification	29	0	1.66	2.00	.484

q5 If yes, which kind	*29*	*0*			
q6 Primary reason you enrolled	*29*	*0*			
q7 How long enrolled	*29*	*0*			
q8 Target date for completion/graduation	*29*	*0*			
q9 Current job title	*29*	*0*			
q10 Employer name, City, State	*29*	*0*			
q11 Salary	*29*	*0*	*3.97*	*4.00*	*1.476*
q12 How long in this position	*29*	*0*			
q13 Number of years working in industry	*29*	*0*			
q14 Gender	*29*	*0*	*1.03*	*1.00*	*.186*
q15 Race	*29*	*0*	*5.41*	*5.00*	*1.053*
q16 Perform better or worse than peers	*29*	*0*			
q17 Best course & why	*29*	*0*			
q18 Worst course & why	*29*	*0*			
q19 Best instructor & why	*29*	*0*			
q20 Overall expertise & value of instructors	*29*	*0*			
q21 Wish would do more	*29*	*0*			
q22 Wish not spend as much time on	*29*	*0*			
q23 Likelihood enroll in ITM again	*29*	*0*			
q24 Additional comments	*29*	*0*			

Frequency Table

q1a Need for professional certification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	*1*	*3.4*	*3.4*	*3.4*
	Somewhat Disagree	*7*	*24.1*	*24.1*	*27.6*
	Somewhat Agree	*7*	*24.1*	*24.1*	*51.7*
	Strongly Agree	*14*	*48.3*	*48.3*	*100.0*
	Total	*29*	*100.0*	*100.0*	

q1b Obtaining adequate skills for locating credible sources

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	*1*	*3.4*	*3.4*	*3.4*
	Somewhat Disagree	*4*	*13.8*	*13.8*	*17.2*
	Somewhat Agree	*15*	*51.7*	*51.7*	*69.0*
	Strongly Agree	*9*	*31.0*	*31.0*	*100.0*
	Total	*29*	*100.0*	*100.0*	

APPENDIX 2-D
ITM APR Current Student Survey Results

q1c Need for seeking & using credible sources of scholarly knowledge

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	6.9	6.9	6.9
	Somewhat Disagree	5	17.2	17.2	24.1
	Somewhat Agree	10	34.5	34.5	58.6
	Strongly Agree	12	41.4	41.4	100.0
	Total	29	100.0	100.0	

q1d Obtaining adequate skills for problem solving

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	3.4	3.4	3.4
	Somewhat Disagree	1	3.4	3.4	6.9
	Somewhat Agree	13	44.8	44.8	51.7
	Strongly Agree	14	48.3	48.3	100.0
	Total	29	100.0	100.0	

q1e Need for problem solving

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	2	6.9	6.9	6.9
	Somewhat Agree	5	17.2	17.2	24.1
	Strongly Agree	22	75.9	75.9	100.0
	Total	29	100.0	100.0	

q1f Obtaining adequate skills for contributing to quality improvement

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	6.9	6.9	6.9
	Somewhat Disagree	1	3.4	3.4	10.3
	Somewhat Agree	10	34.5	34.5	44.8
	Strongly Agree	16	55.2	55.2	100.0
	Total	29	100.0	100.0	

APPENDIX 2-D
ITM APR Current Student Survey Results

q1g Need for quality tools

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	10.3	10.3	10.3
	Somewhat Disagree	1	3.4	3.4	13.8
	Somewhat Agree	8	27.6	27.6	41.4
	Strongly Agree	17	58.6	58.6	100.0
	Total	29	100.0	100.0	

q1h Obtaining adequate skills for making economic decisions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	3.4	3.4	3.4
	Somewhat Disagree	6	20.7	20.7	24.1
	Somewhat Agree	13	44.8	44.8	69.0
	Strongly Agree	9	31.0	31.0	100.0
	Total	29	100.0	100.0	

q1i Need for making economic decisions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	3	10.3	10.3	10.3
	Somewhat Disagree	3	10.3	10.3	20.7
	Somewhat Agree	13	44.8	44.8	65.5
	Strongly Agree	10	34.5	34.5	100.0
	Total	29	100.0	100.0	

q1j Obtaining adequate skills for improving productivity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	3.4	3.6	3.6
	Somewhat Disagree	1	3.4	3.6	7.1
	Somewhat Agree	9	31.0	32.1	39.3
	Strongly Agree	17	58.6	60.7	100.0
	Total	28	96.6	100.0	
Missing	System	1	3.4		
Total		29	100.0		

APPENDIX 2-D
ITM APR Current Student Survey Results

q1k Need for improving productivity

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	*2*	*6.9*	*6.9*	*6.9*
	Somewhat Agree	*9*	*31.0*	*31.0*	*37.9*
	Strongly Agree	*18*	*62.1*	*62.1*	*100.0*
	Total	*29*	*100.0*	*100.0*	

q1l Obtaining adequate skills for improving industrial systems

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	*1*	*3.4*	*3.4*	*3.4*
	Somewhat Disagree	*2*	*6.9*	*6.9*	*10.3*
	Somewhat Agree	*10*	*34.5*	*34.5*	*44.8*
	Strongly Agree	*16*	*55.2*	*55.2*	*100.0*
	Total	*29*	*100.0*	*100.0*	

q1m Need for improving industrial systems

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	*1*	*3.4*	*3.4*	*3.4*
	Somewhat Disagree	*3*	*10.3*	*10.3*	*13.8*
	Somewhat Agree	*8*	*27.6*	*27.6*	*41.4*
	Strongly Agree	*17*	*58.6*	*58.6*	*100.0*
	Total	*29*	*100.0*	*100.0*	

q1n Obtaining adequate skills for communicating effectively

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	*2*	*6.9*	*6.9*	*6.9*
	Somewhat Agree	*12*	*41.4*	*41.4*	*48.3*
	Strongly Agree	*15*	*51.7*	*51.7*	*100.0*
	Total	*29*	*100.0*	*100.0*	

q1o Use significant forms of communication

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	*1*	*3.4*	*3.4*	*3.4*
	Somewhat Agree	*8*	*27.6*	*27.6*	*31.0*
	Strongly Agree	*20*	*69.0*	*69.0*	*100.0*
	Total	*29*	*100.0*	*100.0*	

APPENDIX 2-D
ITM APR Current Student Survey Results

q1p Obtaining adequate skills for assuming leadership role

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	2	6.9	6.9	6.9
	Somewhat Agree	9	31.0	31.0	37.9
	Strongly Agree	18	62.1	62.1	100.0
	Total	29	100.0	100.0	

q1q Need for project mgmt & leadership

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	3.4	3.4	3.4
	Somewhat Disagree	3	10.3	10.3	13.8
	Somewhat Agree	6	20.7	20.7	34.5
	Strongly Agree	19	65.5	65.5	100.0
	Total	29	100.0	100.0	

q1r Obtaining adequate skills for recognizing/improving team dynamics

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	5	17.2	17.9	17.9
	Somewhat Agree	9	31.0	32.1	50.0
	Strongly Agree	14	48.3	50.0	100.0
	Total	28	96.6	100.0	
Missing	System	1	3.4		
Total		29	100.0		

q1s Need for teamwork

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	3	10.3	10.7	10.7
	Somewhat Agree	8	27.6	28.6	39.3
	Strongly Agree	17	58.6	60.7	100.0
	Total	28	96.6	100.0	
Missing	System	1	3.4		
Total		29	100.0		

APPENDIX 2-D
ITM APR Current Student Survey Results

q1t Obtaining adequate skills for mgmt role

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	2	6.9	7.1	7.1
	Somewhat Agree	9	31.0	32.1	39.3
	Strongly Agree	17	58.6	60.7	100.0
	Total	28	96.6	100.0	
Missing	System	1	3.4		
Total		29	100.0		

q1u Need for using mgmt skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	3.4	3.6	3.6
	Somewhat Disagree	2	6.9	7.1	10.7
	Somewhat Agree	8	27.6	28.6	39.3
	Strongly Agree	17	58.6	60.7	100.0
	Total	28	96.6	100.0	
Missing	System	1	3.4		
Total		29	100.0		

q1v Obtaining adequate skills for dealing with global enterprises

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Disagree	5	17.2	17.9	17.9
	Somewhat Agree	10	34.5	35.7	53.6
	Strongly Agree	13	44.8	46.4	100.0
	Total	28	96.6	100.0	
Missing	System	1	3.4		
Total		29	100.0		

q1w Need for global enterprise knowledge

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	6.9	7.1	7.1
	Somewhat Disagree	7	24.1	25.0	32.1
	Somewhat Agree	8	27.6	28.6	60.7
	Strongly Agree	11	37.9	39.3	100.0
	Total	28	96.6	100.0	
Missing	System	1	3.4		
Total		29	100.0		

APPENDIX 2-D
ITM APR Current Student Survey Results

q1x Obtaining adequate skills for further pro development

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	3.4	3.6	3.6
	Somewhat Agree	10	34.5	35.7	39.3
	Strongly Agree	17	58.6	60.7	100.0
	Total	28	96.6	100.0	
Missing	System	1	3.4		
Total		29	100.0		

q1y Need for continued pro development

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	3.4	3.6	3.6
	Somewhat Disagree	3	10.3	10.7	14.3
	Somewhat Agree	8	27.6	28.6	42.9
	Strongly Agree	16	55.2	57.1	100.0
	Total	28	96.6	100.0	
Missing	System	1	3.4		
Total		29	100.0		

q1z Obtaining adequate skills in my professionalism & citizenship

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	3.4	3.6	3.6
	Somewhat Disagree	2	6.9	7.1	10.7
	Somewhat Agree	13	44.8	46.4	57.1
	Strongly Agree	12	41.4	42.9	100.0
	Total	28	96.6	100.0	
Missing	System	1	3.4		
Total		29	100.0		

q1aa Need for citizenship & professionalism

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	1	3.4	3.7	3.7
	Somewhat Disagree	1	3.4	3.7	7.4
	Somewhat Agree	14	48.3	51.9	59.3
	Strongly Agree	11	37.9	40.7	100.0
	Total	27	93.1	100.0	
Missing	System	2	6.9		
Total		29	100.0		

APPENDIX 2-D
ITM APR Current Student Survey Results

q2 Professional certification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	7	24.1	24.1	24.1
	No	22	75.9	75.9	100.0
	Total	29	100.0	100.0	

q3 List certifications

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		22	75.9	75.9	75.9
	ASQ: CQT	1	3.4	3.4	79.3
	Certified Electrical Technician	1	3.4	3.4	82.8
	Certified Lead Auditor for ISO 13485:2003, QMS for the medical device industry	1	3.4	3.4	86.2
	Certified Lean Champion by the National Association of Job Shops and Small Manufactures. (NAJS)	1	3.4	3.4	89.7
	Fluid Power Specialist	1	3.4	3.4	93.1
	Master Electrician License	1	3.4	3.4	96.6
	Soon to obtain a Six Sigma certification	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

q4 Intend to seek professional certification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	10	34.5	34.5	34.5
	No	19	65.5	65.5	100.0
	Total	29	100.0	100.0	

q5 If yes, which kind

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		19	65.5	65.5	65.5
	ASQ: CQE & QM/OE	1	3.4	3.4	69.0
	Certified Quality Engineer/ Manager	1	3.4	3.4	72.4
	Have yet to investigate all options.	1	3.4	3.4	75.9
	Master Electrician License	1	3.4	3.4	79.3
	PE	1	3.4	3.4	82.8
	PMI	1	3.4	3.4	86.2
	Project Management Professional (PMP)	1	3.4	3.4	89.7
	Six Sigma Black Belt	1	3.4	3.4	93.1
	SQA	1	3.4	3.4	96.6
	Yet to be determined.	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

APPENDIX 2-D
ITM APR Current Student Survey Results

q6 Primary reason you enrolled

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		*29*	*100.0*	*100.0*	*100.0*

q7 How long enrolled

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 year	*5*	*17.2*	*17.2*	*17.2*
	1yr	*1*	*3.4*	*3.4*	*20.7*
	2-3 years	*1*	*3.4*	*3.4*	*24.1*
	2 years	*5*	*17.2*	*17.2*	*41.4*
	2.5 years	*1*	*3.4*	*3.4*	*44.8*
	2years	*1*	*3.4*	*3.4*	*48.3*
	3	*1*	*3.4*	*3.4*	*51.7*
	3 Months	*1*	*3.4*	*3.4*	*55.2*
	3 years	*3*	*10.3*	*10.3*	*65.5*
	3 yrs	*1*	*3.4*	*3.4*	*69.0*
	3.5 years	*1*	*3.4*	*3.4*	*72.4*
	4 years	*3*	*10.3*	*10.3*	*82.8*
	4.5 years	*1*	*3.4*	*3.4*	*86.2*
	4yrs	*1*	*3.4*	*3.4*	*89.7*
	5	*1*	*3.4*	*3.4*	*93.1*
	6-weeks	*1*	*3.4*	*3.4*	*96.6*
	spring of 08	*1*	*3.4*	*3.4*	*100.0*
	Total	*29*	*100.0*	*100.0*	

q8 Target date for completion/graduation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2010	*6*	*20.7*	*20.7*	*20.7*
	2011	*4*	*13.8*	*13.8*	*34.5*
	ASAP, while working full time	*1*	*3.4*	*3.4*	*37.9*
	august 09	*1*	*3.4*	*3.4*	*41.4*
	Dec 2009	*6*	*20.7*	*20.7*	*62.1*
	December 2009	*1*	*3.4*	*3.4*	*65.5*
	May 2009	*3*	*10.3*	*10.3*	*75.9*
	May 2010	*3*	*10.3*	*10.3*	*86.2*
	Not yet determined due to my work commitments	*1*	*3.4*	*3.4*	*89.7*
	one class at a time	*1*	*3.4*	*3.4*	*93.1*
	summer 2009	*1*	*3.4*	*3.4*	*96.6*
	When I complete it	*1*	*3.4*	*3.4*	*100.0*
	Total	*29*	*100.0*	*100.0*	

APPENDIX 2-D
ITM APR Current Student Survey Results

q9 Current job title

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	CMM Metrologist	1	3.4	3.4	3.4
	Construction Electrician	1	3.4	3.4	6.9
	Design Engineer	1	3.4	3.4	10.3
	Die maintenance skilled	1	3.4	3.4	13.8
	Employment and Safety Administrator (HR)	1	3.4	3.4	17.2
	Instrumentation Engineer	1	3.4	3.4	20.7
	Lead Engineer	1	3.4	3.4	24.1
	Maintenance and Improvements technician	1	3.4	3.4	27.6
	Manager	1	3.4	3.4	31.0
	Manufacturing Specialist	1	3.4	3.4	34.5
	Material Coordinator	1	3.4	3.4	37.9
	Mechanical Equipment Operator	1	3.4	3.4	41.4
	Outsource Production Coordinator	1	3.4	3.4	44.8
	Product Development Engineer/Laboratory Manager	1	3.4	3.4	48.3
	Product Engineer	1	3.4	3.4	51.7
	Production / Engineering Manager	1	3.4	3.4	55.2
	Production Supervisor	1	3.4	3.4	58.6
	Project Coordinator	1	3.4	3.4	62.1
	Quality Engineer	2	6.9	6.9	69.0
	Quality Manager	2	6.9	6.9	75.9
	Quality technician	1	3.4	3.4	79.3
	Systems Engineer	1	3.4	3.4	82.8
	Test Lab Supervisor	1	3.4	3.4	86.2
	Third shift maintenance lead	1	3.4	3.4	89.7
	TOOL/DIE MAKER	1	3.4	3.4	93.1
	Toolmaker	1	3.4	3.4	96.6
	Unemployed	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

q10 Employer name, City, State

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		3	10.3	10.3	10.3
	AAR Livonia, MI	1	3.4	3.4	13.8
	Alcoa Power and Propulsion, Howmet Casting Whitehall Michigan	1	3.4	3.4	17.2
	ATLAS TOOL INC ROSEVILLE MI	1	3.4	3.4	20.7
	Brillcast Inc. Grand Rapids, Michigan	1	3.4	3.4	24.1
	C-T-C MCC Fruitport, MI	1	3.4	3.4	27.6
	Carter Products Company Inc, Grand Rapids,MI	1	3.4	3.4	31.0
	Compressor Technologies, Inc Grand Rapids, MI	1	3.4	3.4	34.5
	Consumers Energy Muskegon, Mi	1	3.4	3.4	37.9
	Delphi Prototype Operations Saginaw, MI	1	3.4	3.4	41.4

	diversified machine inc mantague,mi	1	3.4	3.4	44.8
	Dow Corning Corp. Auburn, Michigan	1	3.4	3.4	48.3
	Gentex Corporation Zeeland, MI	1	3.4	3.4	51.7
	IBEW 58 Detroit, Michigan	1	3.4	3.4	55.2
	Inteva Products, Troy Mi	1	3.4	3.4	58.6
	Johnson Technology Muskegon, MI	1	3.4	3.4	62.1
	LDI INC, Grand Rapids MI	1	3.4	3.4	65.5
	Mahle Powertrain LLC	1	3.4	3.4	69.0
	Noble International 6781 Grand Haven Rd. Spring Lake, MI 49456	1	3.4	3.4	72.4
	Noble International, Spring Lake, MI	1	3.4	3.4	75.9
	Orchid Bio-Coat Southfield, Michigan	1	3.4	3.4	79.3
	Previous employer - Draexlmaier Automotive, Madison Hts., MI - Gonzalez Process Systems - Madison Hts., MI - contract to GM Koltanbar Engineering, Troy, MI - BIW Project Supervisor	1	3.4	3.4	82.8
	RSDC of Michigan Holt, Mi	1	3.4	3.4	86.2
	Self employed contract positions in Detroit Metro area.	1	3.4	3.4	89.7
	Shape Corp, Grand Haven, MI	1	3.4	3.4	93.1
	Symmetry Medical Inc. Lansing, MI	1	3.4	3.4	96.6
	Woodbridge Foam, Troy, MI	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

q11 Salary

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	$20,001-$39,999	2	6.9	6.9	6.9
	$40,000-$59,999	12	41.4	41.4	48.3
	$60,000-$79,999	9	31.0	31.0	79.3
	$80,000-$99,999	1	3.4	3.4	82.8
	$100,000 or more	1	3.4	3.4	86.2
	Not Applicable	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

q12 How long in this position

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		1	3.4	3.4	3.4
	1 year	3	10.3	10.3	13.8
	1.5 years	2	6.9	6.9	20.7
	10 years	2	6.9	6.9	27.6
	10 yrs.+	1	3.4	3.4	31.0
	14 YEARS	1	3.4	3.4	34.5
	18 months - Draexlmaier 10 years - Gonzalez 15 years - Koltanbar	1	3.4	3.4	37.9
	2 years	5	17.2	17.2	55.2
	3 years	3	10.3	10.3	65.5

	4 years	*2*	*6.9*	*6.9*	*72.4*
	5 years	*2*	*6.9*	*6.9*	*79.3*
	6 months	*1*	*3.4*	*3.4*	*82.8*
	7 years	*1*	*3.4*	*3.4*	*86.2*
	8 years	*2*	*6.9*	*6.9*	*93.1*
	Less than 1 year	*1*	*3.4*	*3.4*	*96.6*
	Started out as a mechanical engineer and have been promoted through the years. I have been with the company for 13 years.	*1*	*3.4*	*3.4*	*100.0*
	Total	*29*	*100.0*	*100.0*	

Average = 4 years in current position

q13 Number of years working in industry

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	10 years	*3*	*10.3*	*10.3*	*10.3*
	11 years	*2*	*6.9*	*6.9*	*17.2*
	12 years	*1*	*3.4*	*3.4*	*20.7*
	13 years	*1*	*3.4*	*3.4*	*24.1*
	15 years	*2*	*6.9*	*6.9*	*31.0*
	18	*1*	*3.4*	*3.4*	*34.5*
	19	*1*	*3.4*	*3.4*	*37.9*
	2 years	*1*	*3.4*	*3.4*	*41.4*
	20 years	*3*	*10.3*	*10.3*	*51.7*
	22	*1*	*3.4*	*3.4*	*55.2*
	23	*1*	*3.4*	*3.4*	*58.6*
	24 years	*1*	*3.4*	*3.4*	*62.1*
	25 years	*1*	*3.4*	*3.4*	*65.5*
	3 years	*1*	*3.4*	*3.4*	*69.0*
	35 years	*1*	*3.4*	*3.4*	*72.4*
	4	*1*	*3.4*	*3.4*	*75.9*
	5 years	*4*	*13.8*	*13.8*	*89.7*
	6	*1*	*3.4*	*3.4*	*93.1*
	8 years	*1*	*3.4*	*3.4*	*96.6*
	8+	*1*	*3.4*	*3.4*	*100.0*
	Total	*29*	*100.0*	*100.0*	

Average = 13.4 years

q14 Gender

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	*28*	*96.6*	*96.6*	*96.6*
	Female	*1*	*3.4*	*3.4*	*100.0*
	Total	*29*	*100.0*	*100.0*	

APPENDIX 2-D
ITM APR Current Student Survey Results

q15 Race

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Caucasian-American/White	25	86.2	86.2	86.2
	Prefer not to respond	4	13.8	13.8	100.0
	Total	29	100.0	100.0	

q16 Perform better or worse than peers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		3	10.3	10.3	10.3
	BETTER, BECAUSE I WANT TO BE SUCCESSFUL.	1	3.4	3.4	13.8
	Better, Drive, knowledge, urgency and understanding.	1	3.4	3.4	17.2
	better, I have learned skills that helps me stand out above the rest.	1	3.4	3.4	20.7
	Better, Lifelong work ethic, Better education.	1	3.4	3.4	24.1
	Better, military training and what I have learned through my courses at Ferris.	1	3.4	3.4	27.6
	Better, Most of my peers do not share my knowledge and experience.	1	3.4	3.4	31.0
	Better. I pursue alternatives to on-going processes, strong work ethics and persistence to improve.	1	3.4	3.4	34.5
	Considering my work load, I perform better than some of my peers.	1	3.4	3.4	37.9
	Depends on the task. Metter in areas of expertise and worse in areas with no experience.	1	3.4	3.4	41.4
	I'm in the mean, due to age & health	1	3.4	3.4	44.8
	I am a top performer within my work group, which is why I am at the level I am at with only an associate’s degree.	1	3.4	3.4	48.3
	I believe I do perform better than most because of the similar training received at work.	1	3.4	3.4	51.7
	I believe I perform better as the ITM program has given me relevant and current skills to help me perform my job duties.	1	3.4	3.4	55.2
	I perform better because I have a strong technical background and have been on the receiving end of decision making.	1	3.4	3.4	58.6
	I perform better in most cases. It is because of my education, determination and need to do well that motivates me.	1	3.4	3.4	62.1
	I perform better. Work ethic.	1	3.4	3.4	65.5
	I spend more time doing things at work rather than talking about or planning. So they have a definite advantage when it comes to talking and planning. I have that urge to just get it done.	1	3.4	3.4	69.0
	I take the initiative to complete the hard tasks.	1	3.4	3.4	72.4
	I typically perform better. Not sure why, maybe it has to do with my Engineering Tech background that helps me understand industrial management/techniques. It sort of seems natural or like common sense, whereas, some other jobs I have had they do not.	1	3.4	3.4	75.9
	I would have to say the same. However, when it comes to solving different companies problems I see I have better skills than others.	1	3.4	3.4	79.3
	I would say better. I have a more recent training and schooling that is above some of the peers that I work with	1	3.4	3.4	82.8

	n/a	1	3.4	3.4	86.2
	Not relevant due to I hold the position and associated responsibilities solely.	1	3.4	3.4	89.7
	same, doesn't matter they only promote by the buddy system	1	3.4	3.4	93.1
	Some better, some worse.	1	3.4	3.4	96.6
	The education that I am receiving has helped me deal with current aspects of my job. It has given me confidence as well as the necessary tools needed in order to succeed.	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

q17 Best course & why

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		4	13.8	13.8	13.8
	APPS 401, Good case studies and a Prof with good involvement.	1	3.4	3.4	17.2
	Capstone, because it will combine all of the classes for the final finished project.	1	3.4	3.4	20.7
	Contemporary Issues in Industrial Mgt. (APPS 401)	1	3.4	3.4	24.1
	I am currently enrolled in the Capstone class and can already see that this is the best course in the program as it helps me see how all of the skills learned in the ITM program can work together. The interaction with other piers is also a great help as it helps me see how others handle issues similar to ones that I may face.	1	3.4	3.4	27.6
	I got the most out of the management courses because I had to change my way of thinking in this department. Managing people outside of the military is completely different.	1	3.4	3.4	31.0
	I had a manufacturing process course through Delta. The class room content was very pour, but the other part of the class involved field trips to 4 local companies, which gave a good taste for different local manufacturing industries and what they do. I think this would be very beneficial to a young student, not know what industries are out there.	1	3.4	3.4	34.5
	I have enjoyed every class so far.	1	3.4	3.4	37.9
	I have not completed all the core courses yet.	1	3.4	3.4	41.4
	I haven't taken enough classes yet	1	3.4	3.4	44.8
	I like the continuous improvement classes.	1	3.4	3.4	48.3
	I really enjoyed Brian Bodermans class on Automation technology. I work with it daily and it was nice to get an understanding from a different prospective and to design a machine on my own.	1	3.4	3.4	51.7
	ISYS 411, Project Management and MGMT 370. If a student could master one or two classes in this program only these would be the ones. Project Management and Operations Management are key classes that anyone will need in life regardless of industry or service.	1	3.4	3.4	55.2
	MFGE 352 Design for Manufacturing. Very interesting and informative class. Good Teacher. Very appropriate for my work in the industry.	1	3.4	3.4	58.6
	MFGE 352, found course interesting, good material, excellent instructor.	1	3.4	3.4	62.1
	mgmt 370 I felt was the best. This class filled huge knowledge gaps for me.	1	3.4	3.4	65.5

	mgmt 370 very interesting and informative.	*1*	*3.4*	*3.4*	*69.0*
	NO OPINION	*1*	*3.4*	*3.4*	*72.4*
	Not sure, for I have not completed all courses.	*1*	*3.4*	*3.4*	*75.9*
	Operations Management - MGMT 370 The course provide a broad spectrum of applications that can be applied to all industries to identify weaknesses and provide solutions.	*1*	*3.4*	*3.4*	*79.3*
	Project Management - it is the most versatile	*1*	*3.4*	*3.4*	*82.8*
	Project Management was the best for me, because I could directly relate the class activities to my day to day responsibilities on the job.	*1*	*3.4*	*3.4*	*86.2*
	project management, it gives you the whole scope of a project & teaches you how to deal with certain situations	*1*	*3.4*	*3.4*	*89.7*
	The best course I have had so far is mfge 352. It catches my interest more probably due to the fact of what I do.	*1*	*3.4*	*3.4*	*93.1*
	The manufacturing processes class. It touches on about every manufacturing process that is widely used.	*1*	*3.4*	*3.4*	*96.6*
	value stream management, just hit a homerun with me and what I want to do with my future	*1*	*3.4*	*3.4*	*100.0*
	Total	*29*	*100.0*	*100.0*	

q18 Worst course & why

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		*4*	*13.8*	*13.8*	*13.8*
	CAD classes may prove to be the least useful, unless one elects to pursue this career, which would not be sufficient for long term employment. Other Software capabilities provide necessary programs that be applied to Industrial Technology. Requires more hi-tech exposure - such as PCs and System integration.	*1*	*3.4*	*3.4*	*17.2*
	don't have one yet	*1*	*3.4*	*3.4*	*20.7*
	don’t have one. I have noticed there are a lot of teachers with quality backgrounds and they push everything with that understanding. I would like a more operational perspective in some of the classes.	*1*	*3.4*	*3.4*	*24.1*
	EHSM 330, Internet course although well laid out, did not engage my interest.	*1*	*3.4*	*3.4*	*27.6*
	ENGL 311. This class is pointless in its current format. The text was outdated and had no relevance (in my opinion) to the real world. I work for a publicly traded company that grosses over $300m in sales annually, and we do not practice 80-90% of these techniques.	*1*	*3.4*	*3.4*	*31.0*
	Have not completed all courses yet.	*1*	*3.4*	*3.4*	*34.5*
	I believe all were useful but the least would be Contemporary Issues in Industrial Management because these issues can get brought up in other management courses of the program. The reiteration of quality and managing is good to have sink in but this class is overkill.	*1*	*3.4*	*3.4*	*37.9*

	I can't recall just now what the last course was that I was enrolled in. It has been about 3 terms since I was enrolled. It was an on-line course (my first). It was a bad experience for me. I didn't get much out of my attempt to instruct myself in a subject that I know nothing about. This was not the actual instructors fault. It is just how I assume internet course are. I like face to face interaction and seeing people's faces as they speak. Sometimes you get a bit more out of the conversation by the facial expressions of the other persons. You don't get this interaction via an e-mail or electronically.	1	3.4	3.4	41.4
	I don't believe there was one for me.	1	3.4	3.4	44.8
	I don't remember the course numbers but during the middle of the cohort, there were 2 or 3 courses which were very similar, and seemed redundant.	1	3.4	3.4	48.3
	I have not completed all the core courses yet.	1	3.4	3.4	51.7
	I haven't had one yet?	1	3.4	3.4	55.2
	I haven't taken enough classes yet	1	3.4	3.4	58.6
	I think the osha laws and regulations class was probably the least useful.	1	3.4	3.4	62.1
	I thought they were all beneficial in some capacity	1	3.4	3.4	65.5
	MFGE 423 Engineering Economics. This was more of an accounting/finance class. In my position I do nothing related to this class.	1	3.4	3.4	69.0
	N/A	1	3.4	3.4	72.4
	NO OPINION	1	3.4	3.4	75.9
	None to think of right now.	1	3.4	3.4	79.3
	Only had 3 courses so far at Ferris. I haven't found one yet.	1	3.4	3.4	82.8
	Operation management was my worst class based on the instructor.	1	3.4	3.4	86.2
	Quality Science Statistics. It wasn't useful because the instructor required all work to be done by hand, and didn't teach us how to use any of the technology and tools available to us in the work environment. It became more busy repetitive work then learning new concepts.	1	3.4	3.4	89.7
	Standardization, poor instructor	1	3.4	3.4	93.1
	The class that I found least useful was the apps 350 class. As a maintenance technician in a high technology company I already knew the material covered. However I know I was the only one in the class with this background. I believe that others found this class more beneficial.	1	3.4	3.4	96.6
	The least helpful class was the OSHA laws and regulations. Although helpful for understanding OSHA, I am not sure it pertained as much to the program as much as the other classes have.	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

q19 Best instructor & why

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		1	3.4	3.4	3.4
	Andrew Purvis or Mark Rusco it's a toss up	1	3.4	3.4	6.9
	Andrew Purvis. He has been very helpful and insightful to all of the issues that you may face in industry.	1	3.4	3.4	10.3

	Any that work in their field of instruction.	1	3.4	3.4	13.8
	At this point I elect Edward Terris. His knowledge and experience prove to be invaluable. His daily dealings with problems and solutions (real world) and how Operations Management is applied tends to a convincing approach to the validity of the program.	1	3.4	3.4	17.2
	Dr. Andrew Purvis has been the most influential, however; all the instructors go above and beyond in displaying their desires for their students to succeed.	1	3.4	3.4	20.7
	Dr. Andy Purvis	1	3.4	3.4	24.1
	Ed Terris, informative, diligent, thorough, involved, concerned.	1	3.4	3.4	27.6
	Edward Terris, so far	1	3.4	3.4	31.0
	I'm not 100% sure, but I think his name was John and taught APPS 350	1	3.4	3.4	34.5
	I don't have a best instructor.	1	3.4	3.4	37.9
	I don’t have a favorite.	1	3.4	3.4	41.4
	I have enjoyed each of the three instructors I have had through the MCC campus. They have been patient with me and my lack of actual manufacturing knowledge. I hold each of the gentlemen in high regard and respect their knowledge and abilities.	1	3.4	3.4	44.8
	I have had 5 classes in the ITM program, so my exposure has been limited. However, if I had to pick an instructor it would be Prof. Lyman. He is succinct and to the point but teaches an excellent online Operations Mgmt class. It is truly an art form when you can teach a class that seems easy to the students, but when they are finished they actually learn a lot. That is being a successful instructor.	1	3.4	3.4	48.3
	I have not completed all the core coursed yet.	1	3.4	3.4	51.7
	I liked John Mola. Very experienced, understanding. Held a very open, interesting class that spurred good class participation. I learned a lot in this class.	1	3.4	3.4	55.2
	I would have to say I got the most out of Ken Clark, although Steve made learning easy and fun.	1	3.4	3.4	58.6
	Joe ??	1	3.4	3.4	62.1
	Ken Clark at the Muskegon campus. Ken currently works in industry and in manufacturing. He was able to constantly make the program relevant to our real world jobs. Ken was able to make the learning enjoyable. Andrew Purvis definitely get honorable mention.	1	3.4	3.4	65.5
	Ken Clark or Steve V. they are both very intelligent about the different kinds of manufacturing and they are very good teachers.	1	3.4	3.4	69.0
	Ken Clark, he brings so much experience to the class room.	1	3.4	3.4	72.4
	My best instructor so far is Joe Joyce. He does a good job of making sure we understand what is being taught and teaches it from different angles and relates it to everyday uses.	1	3.4	3.4	75.9
	Sean Goffnet - very thorough	1	3.4	3.4	79.3
	Sean Goffnet He truly cares about the students and the program and invests the time and effort to make his classes worthwhile	1	3.4	3.4	82.8
	SEAN GOFFNET,HE REALLY CARED THAT PEOPLE SUCCEEDED IN THE CLASS.	1	3.4	3.4	86.2
	Sean Goffnett. Knowledgeable, supportive, and just all out awesome. I'm thinking of an MBA at CMU now because he went there.	1	3.4	3.4	89.7

	Shawn Goffnett was by far the best instructor I had. He was in tune with the students, and worked with us as we tried to balance full time jobs and classes. Coming from industry also helped him relate to us better. I was sad to hear he had left Ferris.	*1*	*3.4*	*3.4*	*93.1*
	steve landenberger, his dedication to making sure you understand the picture and using real world sense in his approaches	*1*	*3.4*	*3.4*	*96.6*
	Tie: Ken Clark, Steve Landenburger, Both instructors very well versed in subject matter, Both instructors seemed to genuinely care about students and student learning material. Both instructors seemed to make great effort to give real life reference to course material. Both instructors on several occasions made themselves available outside of normal class time to give tours of industries relating to the class. A+ rating for both instructors.	*1*	*3.4*	*3.4*	*100.0*
	Total	*29*	*100.0*	*100.0*	

q20 Overall expertise & value of instructors

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		*3*	*10.3*	*10.3*	*10.3*
	Again, I hold each of the three instructors that I have had out of the MCC campus in the highest regards. Each one a true professional with a great deal of knowledge to share with us students. The program is excellent for the right student. I just might not be the right student.	*1*	*3.4*	*3.4*	*13.8*
	All instructors have done a great job	*1*	*3.4*	*3.4*	*17.2*
	All of the teachers that I have had are very knowledgeable in their select fields and teach very well.	*1*	*3.4*	*3.4*	*20.7*
	All very good except a few couple of adjuncts	*1*	*3.4*	*3.4*	*24.1*
	Both good & bad	*1*	*3.4*	*3.4*	*27.6*
	Both of my Instructors are very smart. But I will say I prefer how Joe Joyce teaches. My other Instructor for mgmt 370 does not take the time to explain things a different way if we do not understand them. He is also very rigid in his opinions and grading with the average grade in the c range and almost no a's.	*1*	*3.4*	*3.4*	*31.0*
	Everyone was good. The teachers enjoyed instructing, work in the field and you could tell in the way they presented the class.	*1*	*3.4*	*3.4*	*34.5*
	excellent, if not for my instructors I would not have gained the value of industry improvement that I have gained.	*1*	*3.4*	*3.4*	*37.9*
	I appreciate that the instructors has real life experience in the classes that they are teaching.	*1*	*3.4*	*3.4*	*41.4*
	I feel real good, everyone is in or has been part of a manufacturing industry so their experience is a plus.	*1*	*3.4*	*3.4*	*44.8*
	I feel that the expertise and value of the instructors that I have had is high. Most can help with any life like problems and are able to teach/ aid in the learning well.	*1*	*3.4*	*3.4*	*48.3*
	I like all the instructors. I was disappointed in one, not Sean. He promised me a letter of recommendation and never delivered after several reminders.	*1*	*3.4*	*3.4*	*51.7*
	It was great thus far	*1*	*3.4*	*3.4*	*55.2*
	Most have been very good	*1*	*3.4*	*3.4*	*58.6*

	OTHER THAN SEAN GOFFNET ALL THE OTHER INSTRUCTORS SEEMED AVERAGE AT BEST.	1	3.4	3.4	62.1
	Overall everything is great! Instructors are more than willing to listen and guide you in the right direction.	1	3.4	3.4	65.5
	Overall I think it's great. Every teacher I have encountered in the program has had experience in industry. The teachers have all been able to make the classes relate to our jobs.	1	3.4	3.4	69.0
	So far I think the instructors do a fine job with the courses.	1	3.4	3.4	72.4
	Some instructors are good; Mola, Joyce, Goffnet, Purvis, & Culik. Some, (usually adjuncts) are pretty bad. Goffnet & Culik have both left FSU.	1	3.4	3.4	75.9
	The instructors all come from the manufacturing background and I find that very helpful. They are able to relate the information in an understandable way.	1	3.4	3.4	79.3
	The instructors made the program in my opinion. I had great experiences with Ken, Steve and Hugh Culik.	1	3.4	3.4	82.8
	They have been either great or plainly bad. Dr. O'Connor is so confusing as to what he wants. He gives a lot of information, but only 5% of it is actually relevant. Prof. Bodeman was another instructor that was very much ill-prepared for the APPS350 class. He just couldn't let go of the fact that we were not engineers and in return he couldn't teach much of the "management" type stuff about automation. Everyone else, Prof. Lyman, Prof. McCormick and Prof. Sacco have been phenomenal!	1	3.4	3.4	86.2
	Unfortunately there are too many part time teachers in highly skilled classes, that do not know the best way to extend their knowledge.	1	3.4	3.4	89.7
	Very good expertise and knowledge.	1	3.4	3.4	93.1
	were good. Most had industry experience and could relate course content with real world examples. Although I had a few adjunct instructors at Delta who were not very good instructors.	1	3.4	3.4	96.6
	You cannot substitute experience. Instructors that apply what they teach, fortify class exercises and discussions.	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

q21 Wish would do more

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		3	10.3	10.3	10.3
	cad classes, most the jobs I want to apply for require this in some capacity and I have no background in it.	1	3.4	3.4	13.8
	classes that deal with business law and finance.	1	3.4	3.4	17.2
	Field trips and overviews of different manufacturing experiences.	1	3.4	3.4	20.7
	hands-on (example) work in class	1	3.4	3.4	24.1
	Hands-on, real-world experiences. I would like to learn more about what's happening in my industry.	1	3.4	3.4	27.6
	hands on projects.	1	3.4	3.4	31.0
	I'm unable to finish this sentence at this time.	1	3.4	3.4	34.5
	I don't know yet.	1	3.4	3.4	37.9
	I have not completed all the core courses yet.	1	3.4	3.4	41.4
	I like the program as it is.	1	3.4	3.4	44.8

	I wish I would do more small projects that pertain to the ITM program.	1	3.4	3.4	48.3
	I wish you did more plant tours. Steve and Ken did a good job of setting up plant tours and teaching us how what we were reading about actually worked in a production environment.	1	3.4	3.4	51.7
	I would like to have more class discussions involving Failing companies. Success is easy to preach. Discussing the possibilities regarding why these companies are failing and how the courses can be applied would be a benefit.	1	3.4	3.4	55.2
	Labs	1	3.4	3.4	58.6
	learning about quality assurance/ management.	1	3.4	3.4	62.1
	Management classes	1	3.4	3.4	65.5
	Manufacturing related focus instead of the already filled managing. The current Design for Manufacturing course should be 3 credits.	1	3.4	3.4	69.0
	On hands or role playing to gain experience in conducting meetings, project presentations, and so forth. In addition, possibly touring different companies to see real manufacturing.	1	3.4	3.4	72.4
	on plant tours. Great way to see what we are learning applied.	1	3.4	3.4	75.9
	people skills and management.	1	3.4	3.4	79.3
	Personal involvement on my job needs and my career goals but I do understand that it must be general enough to hit everyone's needs.	1	3.4	3.4	82.8
	PLANT LAYOUT	1	3.4	3.4	86.2
	Response to real life situations, on the floor of a company.	1	3.4	3.4	89.7
	Six Sigma	1	3.4	3.4	93.1
	The professors need to communicate more to make sure they are not repeating the same material that was already covered in other classes	1	3.4	3.4	96.6
	to find some better books. The lean manufacturing books are small and extremely overpriced.	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

q22 Wish not spend as much time on

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		4	13.8	13.8	13.8
	Algebra and Physics. I truly and honestly fear these subjects. I would do just about anything to be able secure the required credits with other courses more related in the HR field, if allowed.	1	3.4	3.4	17.2
	all classes were and are important to this program. I couldn't take any of them away at this point in time.	1	3.4	3.4	20.7
	All of the other classes besides the core classes like humanities and social sciences.	1	3.4	3.4	24.1
	CAD. CAD is necessary to understand but in the position that I see ITM students filling CAD is necessary to know, but not master.	1	3.4	3.4	27.6
	Financial issues. My experience says that the typical Engineer/Technician/Manager does not really have much of a financial input to his company.	1	3.4	3.4	31.0
	Homework. In my mgmt 370 class we spend an excessive amount of time on homework. I would say I spend double the time on that class as my other 4 classes combined.	1	3.4	3.4	34.5

	I don't know yet.	1	3.4	3.4	37.9
	I have had classes that I wish we had more time and often less.	1	3.4	3.4	41.4
	I have not completed all the core courses yet.	1	3.4	3.4	44.8
	I like the program as it is.	1	3.4	3.4	48.3
	Internet courses	1	3.4	3.4	51.7
	Lean	1	3.4	3.4	55.2
	lean manufacturing, beating to death the importance of Toyota production systems and all of the pioneers of lean manufacturing.	1	3.4	3.4	58.6
	Managing classes that repeat over and over the same principles.	1	3.4	3.4	62.1
	NO OPINION	1	3.4	3.4	65.5
	nothing applies	1	3.4	3.4	69.0
	obsolete practices. (memorandum writing and 4/5 of a semester of going over things like cylinders and bowl feeders in APPS 350).	1	3.4	3.4	72.4
	on humanities, psychology, and all that other stuff but I know it will come in handy the further I go in my career dealing with people.	1	3.4	3.4	75.9
	Physics. Loose this course.	1	3.4	3.4	79.3
	Physics?	1	3.4	3.4	82.8
	see Q18	1	3.4	3.4	86.2
	specific automotive examples	1	3.4	3.4	89.7
	Teamwork - although it plays an important role in a work environment - the class environment has little motivators to succeed and alienates students that are virtually powerless. In today's economy, the dead wood is eliminated. I like to know my own personal performance, and weaknesses.	1	3.4	3.4	93.1
	TESTS. ha-ha Don't know yet	1	3.4	3.4	96.6
	writing papers and formal reports. I feel that completing actual exercises and real problem solving/ tasks would be more beneficial. Every class has a formal report, thus building skill on reporting a project or task, but little work goes into actual work for the report.	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

q23 Likelihood enroll in ITM again

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		4	13.8	13.8	13.8
	100% likelihood that I would enroll in this program. It provides the missing links needed to become more marketable for employment in a extremely competitive arena.	1	3.4	3.4	17.2
	100% sure I would. I feel that this program is very up to date with real world issues and problems. Most versatile program in a varying market of careers.	1	3.4	3.4	20.7
	I absolutely would. The overall emphasis of this degree fits my career path to a T. It compliments my experience and will prepare for whatever direction I take next for my Master's.	1	3.4	3.4	24.1
	I don't understand this questions.	1	3.4	3.4	27.6
	I enjoy this program. When I applied to Ferris I enrolled in the auto management program. I saw after the first class session that it wasn't for me, so I switched to ITM.	1	3.4	3.4	31.0
	I have not completed all the core courses yet.	1	3.4	3.4	34.5

	I would definitely enroll again. The program offered a good blend of online and instructor lead classes.	1	3.4	3.4	37.9
	I would enroll again because the program is really geared toward industry and how it operates and can improve. I think this program is a great program.	1	3.4	3.4	41.4
	I WOULD ENROLL AGAIN BECAUSE THE PROGRAM UTILIZES MANY OF MY MACOMB COURSES.	1	3.4	3.4	44.8
	I would enroll again due to the ready access to class sites, the benefit of class transfers and the economical cost of credits.	1	3.4	3.4	48.3
	I would, most everything applies and the Profs are great people that I can learn from.	1	3.4	3.4	51.7
	I would. It suites my personality. I haven't had to find a job in the profession yet, so time will tell how useful it is.	1	3.4	3.4	55.2
	I would. This is a good program.	1	3.4	3.4	58.6
	If dictated, my choice in the matter would be very limited so the likelihood would be somewhat obvious.	1	3.4	3.4	62.1
	If the course was still available in Muskegon, there would be a very strong likelihood.	1	3.4	3.4	65.5
	NA	1	3.4	3.4	69.0
	Probably, It's a good program but it will be dictated by the job market in Michigan.	1	3.4	3.4	72.4
	Probably. There is a lot to learn out there and manufacturing is always changing. This is a good way to meet people of different industries and stay current on the processes.	1	3.4	3.4	75.9
	very high. I actually recommend it to my co-workers constantly. I think that the program is relevant. I also enjoy learning more about the business as a whole.	1	3.4	3.4	79.3
	YES - I thank everyone involved in this program. It is perfect for what it was intended to accomplish - helping the working professional obtain a degree using their current background related to industry	1	3.4	3.4	82.8
	yes I would, I enjoyed the instructors and classmates	1	3.4	3.4	86.2
	Yes, as it has helped me grow personally and professionally. The downside was the limited number of classes available in Muskegon.	1	3.4	3.4	89.7
	Yes, I would enroll in the program, because it is allowing me to complete my degree in a relative short amount of time.	1	3.4	3.4	93.1
	yes, it's a great program for someone that is working full time and obtaining skill sets that will help them in their current job	1	3.4	3.4	96.6
	yes, overall it was a good experience with convenient locations and class schedules that worked well with a full time job,	1	3.4	3.4	100.0
	Total	29	100.0	100.0	

q24 Additional comments

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		15	51.7	51.7	51.7
	Again, this program for the most part doesn't pertain to my daily duties and position responsibilities. It does allow me to have clearer communications and understanding of our technical and Engineer level employees and the situations and they face.	1	3.4	3.4	55.2

APPENDIX 2-D
ITM APR Current Student Survey Results

	I am very happy with the program. Again I cannot stress my appreciation for instructors such as Ken Clark, Steve Landenburger and Hugh Culik enough. Good job finding these instructors, I hope other areas where able to have instructors of this caliber.	*1*	*3.4*	*3.4*	*58.6*
	I have taken classes at both the Grand Rapids campus and Muskegon Campus. I do very much enjoy the IT&M program, and recommend it often. It would be nice if there were more classes offered online, and more scheduling options.	*1*	*3.4*	*3.4*	*62.1*
	I think the program is based on good concepts. It is a vast amount of material to cover and mostly relevant.	*1*	*3.4*	*3.4*	*65.5*
	I think this program is a great opportunity for people like me, (with a technical career) without having to take the higher math classes, (calculus & higher).	*1*	*3.4*	*3.4*	*69.0*
	I thought the program was definitely tailored to the working individual. I was able to balance the class load with my full time job. The classes were offered after normal working hours which was great. The class load was not extreme, and have an instruct as an advisor was key. I do think that the program should be advertised more at the off campus locations. I had a few people interested in this program in the Delta College area, by the program was stopped because of lack of interest, but to my knowledge no advertising was done to let students know the program was available. I think if you offered more programs link this in the tricity area, you would definitely have some interest, especially considering you have some major companies like [OMIT] in the area with employees who need to broaden their educations. If the cohort could not be done with on campus instructors, then an online version would be very beneficial. I thought the program had a good balance of online and instructor lead courses. I would be willing to discuss more if you want to contact me. [contact information OMITTED]	*1*	*3.4*	*3.4*	*72.4*
	I would like a more operational approach into the courses instead of the quality focus. I appreciate quality but it is only a part of the manufacturing environment.	*1*	*3.4*	*3.4*	*75.9*
	Keep this program alive in Muskegon and give it a chance to catch on. The west Michigan area is full of manufacturing and this program would be great for a lot of people in the area.	*1*	*3.4*	*3.4*	*79.3*
	maybe just look at what is available for jobs in the area and tailor a few more classes to fit those areas: CAD classes would really help/ also spell check the survey	*1*	*3.4*	*3.4*	*82.8*
	More class availability. Having to wait months or years to complete the program is a deterrent to recruitment and depressing to current students. Core classes need to be offered every term, so knowledge gained can be applied and incorporated in other classes. MORE FULL-TIME INSTRUCTORS that have honed their skills through experience.	*1*	*3.4*	*3.4*	*86.2*
	None	*2*	*6.9*	*6.9*	*93.1*
	Please try to find better adjunct teachers. Some managed the class OK given their situation but their understanding of topics or teaching skills were poor.	*1*	*3.4*	*3.4*	*96.6*
	You need to get Sean back. Big raise, fat bonus, whatever it takes. I still go to him for my advising. He's willing to help me anytime and he's not even on the Ferris payroll anymore. The program lost a great asset.	*1*	*3.4*	*3.4*	*100.0*
	Total	*29*	*100.0*	*100.0*	

APPENDIX 2-E
ITM APR Advisory Panel Survey Results

Frequencies

Prepared by: Institutional Research & Testing, 04/09

Statistics

	N		Mean	Median	Std. Deviation
	Valid	Missing	Valid	Missing	Valid
q1a Programs are consistent with FSU's mission	7	0	4.00	4.00	.000
q1b Students are well prepared to enter the workforce	7	0	3.86	4.00	.690
q1c Better prepares students to enter industry	7	0	3.71	4.00	.756
q1d Grads contribute as much as grads from similar programs	7	0	4.43	5.00	.787
q1e Provides a foundation for multiple career possibilities	7	0	3.71	4.00	.488
q1f Job opportunities available to graduates	7	0	3.86	4.00	.690
q2a Professional Certification	7	0	2.57	3.00	.976
q2b Seek technical references	7	0	2.43	2.00	.535
q2c Problem Solving/Decision Making	7	0	3.00	3.00	.000
q2d Quality Improvement Initiatives	7	0	2.86	3.00	.378
q2e Perform economic analyses	7	0	2.43	2.00	.535
q2f Productivity Improvement	7	0	2.86	3.00	.378
q2g Improve industrial systems	7	0	2.29	2.00	.488
q2h Effective Communication	7	0	3.00	3.00	.000
q2i Leadership/Project Management	7	0	3.00	3.00	.000
q2j Effective Teamwork	7	0	2.86	3.00	.378
q2k Management Skills	7	0	2.43	2.00	.535
q2l International Enterprises & Strategy	7	0	1.86	2.00	.378
q2m Personal Growth & Assessment	7	0	2.43	3.00	.787
q2n Citizenship & Professionalism	7	0	2.86	3.00	.378
q2o Computer Aided Design & Drafting	7	0	2.14	2.00	.378
q2p General Automation Technologies	7	0	2.29	2.00	.488
q2q Lean Manufacturing Methods	7	0	2.86	3.00	.378
q2r Management Fundamentals	7	0	2.57	3.00	.535
q2s Emerging Topics in Management	7	0	2.14	2.00	.378
q2t Project Management	7	0	2.71	3.00	.488
q2u ISO/TS/QS Certification	7	0	2.29	2.00	.951
q2v Statistics & Statistical Methods	7	0	2.57	3.00	.535
q2w Manufacturing Processes	7	0	2.86	3.00	.378
q2x Manufacturing Improvement Methods	7	0	3.00	3.00	.000
q2y Engineering Economics	7	0	2.57	3.00	.535
q2z Operations Management	7	0	2.14	2.00	.378
q2aa Other	3	4	4.00	4.00	.000
q2ab Other specified	7	0			
q3 Strengths of program	7	0			
q4 Qualities/skills grads lack	7	0			
q5 Areas needing improvement/extensive coverage	7	0			
q6 Emerging trends	7	0			
q7 Comments/suggestions	7	0			

APPENDIX 2-E
ITM APR Advisory Panel Survey Results
Frequency Table

q1a Programs are consistent with FSU's mission

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Agree	*7*	*100.0*	*100.0*	*100.0*

q1b Students are well prepared to enter the workforce

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Agree	*2*	*28.6*	*28.6*	*28.6*
	Strongly Agree	*4*	*57.1*	*57.1*	*85.7*
	Unable to Judge	*1*	*14.3*	*14.3*	*100.0*
	Total	*7*	*100.0*	*100.0*	

q1c Better prepares students to enter industry

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Agree	*3*	*42.9*	*42.9*	*42.9*
	Strongly Agree	*3*	*42.9*	*42.9*	*85.7*
	Unable to Judge	*1*	*14.3*	*14.3*	*100.0*
	Total	*7*	*100.0*	*100.0*	

q1d Grads contribute as much as grads from similar programs

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Agree	*1*	*14.3*	*14.3*	*14.3*
	Strongly Agree	*2*	*28.6*	*28.6*	*42.9*
	Unable to Judge	*4*	*57.1*	*57.1*	*100.0*
	Total	*7*	*100.0*	*100.0*	

q1e Provides a foundation for multiple career possibilities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Agree	*2*	*28.6*	*28.6*	*28.6*
	Strongly Agree	*5*	*71.4*	*71.4*	*100.0*
	Total	*7*	*100.0*	*100.0*	

q1f Job opportunities available to graduates

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Agree	*2*	*28.6*	*28.6*	*28.6*
	Strongly Agree	*4*	*57.1*	*57.1*	*85.7*
	Unable to Judge	*1*	*14.3*	*14.3*	*100.0*
	Total	*7*	*100.0*	*100.0*	

APPENDIX 2-E
ITM APR Advisory Panel Survey Results

q2a Professional Certification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Needed	1	14.3	14.3	14.3
	Somewhat Needed	2	28.6	28.6	42.9
	Greatly Needed	3	42.9	42.9	85.7
	Does Not Apply	1	14.3	14.3	100.0
	Total	7	100.0	100.0	

q2b Seek technical references

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	4	57.1	57.1	57.1
	Greatly Needed	3	42.9	42.9	100.0
	Total	7	100.0	100.0	

q2c Problem Solving/Decision Making

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Greatly Needed	7	100.0	100.0	100.0

q2d Quality Improvement Initiatives

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	1	14.3	14.3	14.3
	Greatly Needed	6	85.7	85.7	100.0
	Total	7	100.0	100.0	

q2e Perform economic analyses

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	4	57.1	57.1	57.1
	Greatly Needed	3	42.9	42.9	100.0
	Total	7	100.0	100.0	

q2f Productivity Improvement

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	1	14.3	14.3	14.3
	Greatly Needed	6	85.7	85.7	100.0
	Total	7	100.0	100.0	

APPENDIX 2-E
ITM APR Advisory Panel Survey Results

q2g Improve industrial systems

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	*5*	*71.4*	*71.4*	*71.4*
	Greatly Needed	*2*	*28.6*	*28.6*	*100.0*
	Total	*7*	*100.0*	*100.0*	

q2h Effective Communication

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Greatly Needed	*7*	*100.0*	*100.0*	*100.0*

q2i Leadership/Project Management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Greatly Needed	*7*	*100.0*	*100.0*	*100.0*

q2j Effective Teamwork

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	*1*	*14.3*	*14.3*	*14.3*
	Greatly Needed	*6*	*85.7*	*85.7*	*100.0*
	Total	*7*	*100.0*	*100.0*	

q2k Management Skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	*4*	*57.1*	*57.1*	*57.1*
	Greatly Needed	*3*	*42.9*	*42.9*	*100.0*
	Total	*7*	*100.0*	*100.0*	

q2l International Enterprises & Strategy

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Needed	*1*	*14.3*	*14.3*	*14.3*
	Somewhat Needed	*6*	*85.7*	*85.7*	*100.0*
	Total	*7*	*100.0*	*100.0*	

q2m Personal Growth & Assessment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Needed	*1*	*14.3*	*14.3*	*14.3*
	Somewhat Needed	*2*	*28.6*	*28.6*	*42.9*
	Greatly Needed	*4*	*57.1*	*57.1*	*100.0*
	Total	*7*	*100.0*	*100.0*	

q2n Citizenship & Professionalism

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	1	14.3	14.3	14.3
	Greatly Needed	6	85.7	85.7	100.0
	Total	7	100.0	100.0	

q2o Computer Aided Design & Drafting

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	6	85.7	85.7	85.7
	Greatly Needed	1	14.3	14.3	100.0
	Total	7	100.0	100.0	

q2p General Automation Technologies

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	5	71.4	71.4	71.4
	Greatly Needed	2	28.6	28.6	100.0
	Total	7	100.0	100.0	

q2q Lean Manufacturing Methods

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	1	14.3	14.3	14.3
	Greatly Needed	6	85.7	85.7	100.0
	Total	7	100.0	100.0	

q2r Management Fundamentals

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	3	42.9	42.9	42.9
	Greatly Needed	4	57.1	57.1	100.0
	Total	7	100.0	100.0	

q2s Emerging Topics in Management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	6	85.7	85.7	85.7
	Greatly Needed	1	14.3	14.3	100.0
	Total	7	100.0	100.0	

APPENDIX 2-E
ITM APR Advisory Panel Survey Results

q2t Project Management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	2	28.6	28.6	28.6
	Greatly Needed	5	71.4	71.4	100.0
	Total	7	100.0	100.0	

q2u ISO/TS/QS Certification

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Needed	1	14.3	14.3	14.3
	Somewhat Needed	4	57.1	57.1	71.4
	Greatly Needed	1	14.3	14.3	85.7
	Does Not Apply	1	14.3	14.3	100.0
	Total	7	100.0	100.0	

q2v Statistics & Statistical Methods

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	3	42.9	42.9	42.9
	Greatly Needed	4	57.1	57.1	100.0
	Total	7	100.0	100.0	

q2w Manufacturing Processes

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	1	14.3	14.3	14.3
	Greatly Needed	6	85.7	85.7	100.0
	Total	7	100.0	100.0	

q2x Manufacturing Improvement Methods

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Greatly Needed	7	100.0	100.0	100.0

q2y Engineering Economics

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	3	42.9	42.9	42.9
	Greatly Needed	4	57.1	57.1	100.0
	Total	7	100.0	100.0	

q2z Operations Management

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Somewhat Needed	6	85.7	85.7	85.7
	Greatly Needed	1	14.3	14.3	100.0
	Total	7	100.0	100.0	

q2aa Other

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Does Not Apply	3	42.9	100.0	100.0
Missing	System	4	57.1		
Total		7	100.0		

q3 Strengths of program

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		1	14.3	14.3	14.3
	a broad based education, networking opportunities with other industry professionals and strong instructors	1	14.3	14.3	28.6
	Enrolling people who are currently employed and who are motivated to learn	1	14.3	14.3	42.9
	the combination of technology and business education, and how they complement each other	1	14.3	14.3	57.1
	The diversity of the offerings	1	14.3	14.3	71.4
	The exposure of the students to a wide range of topics related to industry. Utilizing "real world" instructors adds legitimacy to the of the program.	1	14.3	14.3	85.7
	Works well with the non-traditional student that has practical work experience that needs to be rounded out with academics.	1	14.3	14.3	100.0
	Total	7	100.0	100.0	

q4 Qualities/skills grads lack

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		4	57.1	57.1	57.1
	Communication skills/personnel management skills	1	14.3	14.3	71.4
	None.	1	14.3	14.3	85.7
	The ability to do simple statistical analysis and to communicate more formally both verbally and in writing.	1	14.3	14.3	100.0
	Total	7	100.0	100.0	

APPENDIX 2-E
ITM APR Advisory Panel Survey Results

q5 Areas needing improvement/extensive coverage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		*1*	*14.3*	*14.3*	*14.3*
	Effective teamwork and communication are the non technical cornerstones for upward mobility. Need a formal course to focus and improve their skill sets on these topics.	*1*	*14.3*	*14.3*	*28.6*
	Effective written and verbal communication skills Effective Teamwork and interpersonal skills	*1*	*14.3*	*14.3*	*42.9*
	General management skills	*1*	*14.3*	*14.3*	*57.1*
	get more students into real world co-op experiences/projects	*1*	*14.3*	*14.3*	*71.4*
	I think more emphasis on written communication is required. Ideas aren't any good if they cannot be conveyed.	*1*	*14.3*	*14.3*	*85.7*
	Offer more classes, more often	*1*	*14.3*	*14.3*	*100.0*
	Total	*7*	*100.0*	*100.0*	

q6 Emerging trends

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		*4*	*57.1*	*57.1*	*57.1*
	Automation, Lean technologies, Toyota Production System.	*1*	*14.3*	*14.3*	*71.4*
	Ethics, integrity and transparency are assumed as given; however it needs to be made explicit and consequences for violation to individual and company.	*1*	*14.3*	*14.3*	*85.7*
	Understanding finance for non-financial people; management skills	*1*	*14.3*	*14.3*	*100.0*
	Total	*7*	*100.0*	*100.0*	

q7 Comments/suggestions

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid		*5*	*71.4*	*71.4*	*71.4*
	Pick assignments that relate to your job.	*1*	*14.3*	*14.3*	*85.7*
	See Reponses to questions 5 and 6 above.	*1*	*14.3*	*14.3*	*100.0*
	Total	*7*	*100.0*	*100.0*	

SECTION 3: PROGRAM PROFILE

Program: Industrial Technology and Management

A. Student Profile

Gender

The typical student in the program is a nontraditional student with a full time position. The average age of the students reflects this as reports indicate the average age of students as 37 for 2008-2009.[7] In previous years, this value has varied, but only slightly, from 36 to 38 as a total range. The range of ages for students in the program is from about 24 to 60 years of age, although this range has not been verified except through anecdotal evidence and verbal reports. As would be expected, the vast majority of students in the program are male, although enrollment includes a small but consistent female gender presence of students in the program. Figure 6 displays the average distribution of gender as reported from the Office of Institutional Research and Testing for the past five (5) academic years.

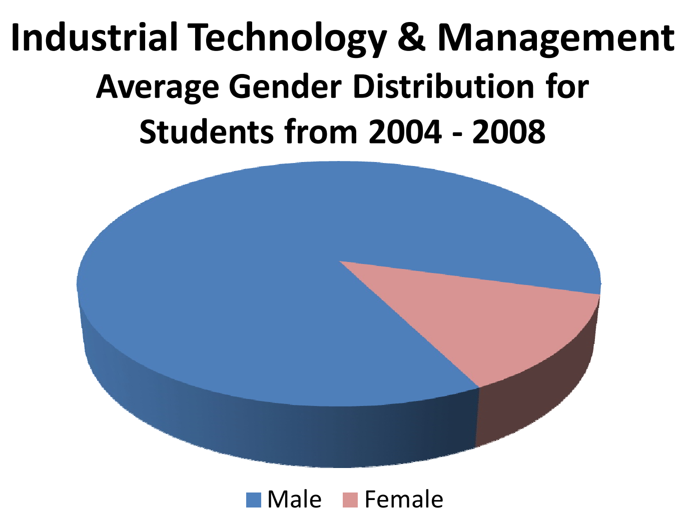

Figure 6: An illustration of the average gender distribution of students in the Industrial Technology and Management Program at Ferris State University for the 2004-2008 academic years. The average student population per year of 58 male students and 9 female students is displayed. Data obtained from [7].

Race and Ethnic Background

Similarly, race and ethnic background data was also offered from the Office of Institutional Research and Testing and is presented in Figure 7. As expected, the vast majority of students in the program list Caucasian as their background, although there are notable other categories represented in the student population. Specific actions to level this distribution have not yet been taken, although there are a number of items under consideration including targeted scholarships, promotional materials printed in multiple languages and others.

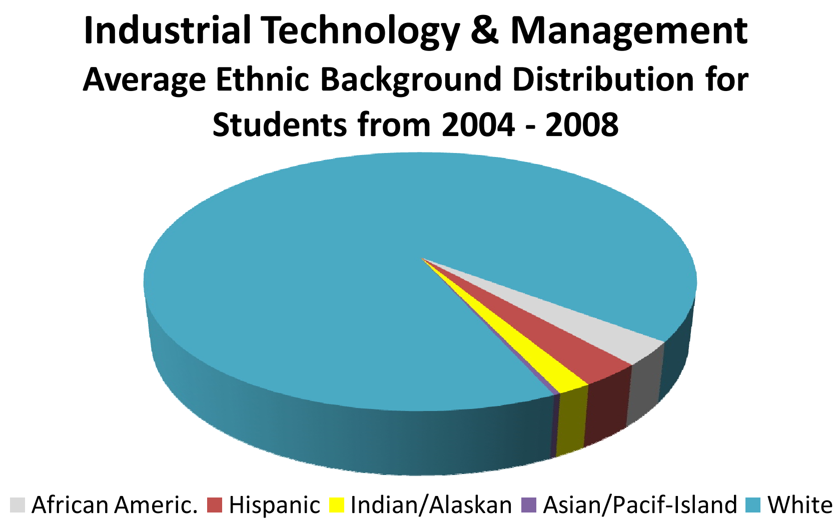

Figure 7: An illustration of the average race and ethnic background distribution of students in the Industrial Technology and Management Program at Ferris State University for the 2004-2008 academic years. Data obtained from [7].

Student Status

All students in the program are residents of the State of Michigan and for practical purposes; all students are considered part-time students. All students are enrolled in off-campus courses, except for those that are delivered via the Internet. The vast majority of 'ground' courses are offered in the evenings. Every student in the program must enroll in a number of Internet-delivered and mixed-delivery courses, as there remain several courses that can only be obtained via the Internet. In addition, in the Fall of 2008, an adjustment in the delivery format of courses was unveiled, from a directive by the CPTS Dean. Approximately half of the courses in the program were to be offered and delivered via the Internet. This is perhaps the only matter which can lead to potential issues with the program, as with mandated Internet delivery, it becomes highly challenging to find qualified and willing adjunct instructors for courses in the program. In addition, students have often commented on wanting to enroll in classroom settings, and find Internet delivery a less than optimum method of instruction or learning. Some of these comments were also obtained from the APR survey instruments detailed in Section 2 of this document. Other challenges the program faces will be addressed in a separate portion of this document.

Student Quality

Student Grade Point Average

The grade point average of students in the program has been reported from the Office of Institutional Research and Testing. Figure 8 shows the distribution of grades reported for the past five (5) academic years for students in the program. These values are seen as a good representation of the student population in the program, with nontraditional students of a more serious nature than younger traditional students, motivated to succeed by their own life experiences. Also on Figure 8, the maximum and minimum grade point average values are displayed, which indicate the presence of successful students, and those that have experienced difficulty as well. To date, three students have been dismissed from the program because of poor grades.

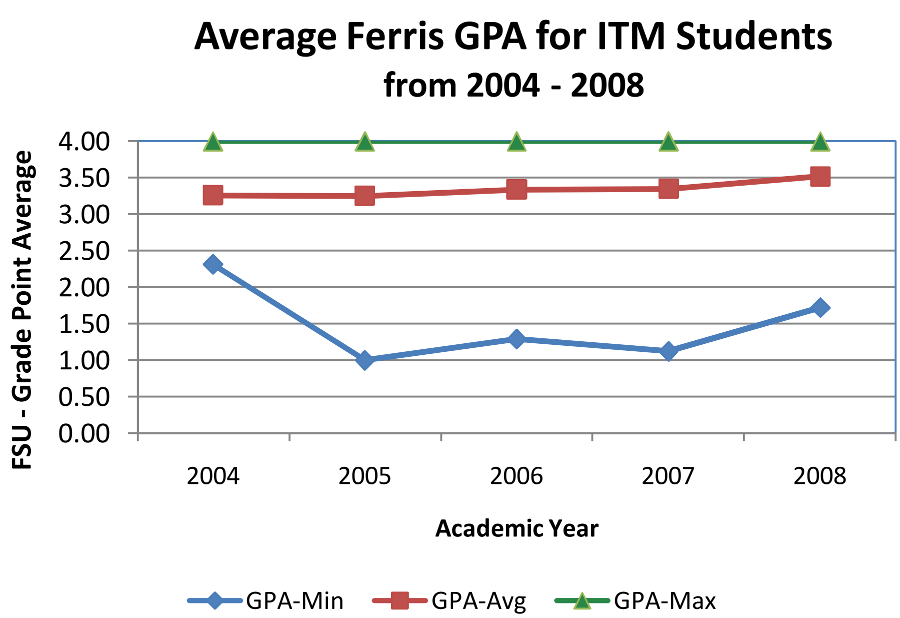

Figure 8: An illustration of the average grade point average distribution of students in the Industrial Technology and Management Program at Ferris State University for the 2004-2008 academic years. Data obtained from [7].

ACT Scores

The average ACT scores of students were provided to the department, but the number of students which either took this examination or required this examination was quite low, given the nature of the program and corresponding university admissions policies. The average reported score to the department ranged from 18.2 to 20.0, with high values of 26 and low values of 14. While these values may appear lower than the average expectations of Ferris State University, all admitted students exceed the admission criteria established for the program. In addition, with an average age of 37 and having already taken more than 50 credit hours of college coursework, whatever score students may have attained on the ACT examination in previous years are largely irrelevant.

Job Placement

The typical term of job 'placement' does not offer the best information for graduates of the ITM program. Since the vast majority of students already have a full time position, 'placement' becomes almost an irrelevant measure. The results from surveys of graduates have been presented in Section 2-A of this document, but some notable items from this can be addressed in this portion of the overall review. As reported, the "Placement Rate" of graduates would be 87.5% within six months of graduation from the program. [8] Salaries of program graduates are among the highest of all baccalaureate level programs offered by Ferris, reported from the survey data at $62,400 annually. [9] In addition, due to the unique nature of the program and its students, promotions to higher levels of responsibility have been common. Work is ongoing regarding comprehensive program assessment, matters of formal accreditation, and faculty enhancement that are a portion of the program focus.

B. Enrollment

The official enrollment figures compiled by the Office of Institutional Research and Testing are presented in Table XII. Along with official enrollment counts from various semesters, additional information is offered, such as full time equivalent faculty, credit hour production, degrees awarded in the program and other information which will be addressed in subsequent sections of this document. The information displayed includes what the program faculty members indicate as 'total' credit hour production. The footnote at the bottom of the page explains the reasoning for this inclusion, primarily as a result of the numerous courses taken by program students from other disciplines. While some service courses in the program also enroll students from programs other than ITM, a large fraction of these courses were offered as dedicated sections for the program students. Including the 'total' credit hours generated by students, the credit hour production tends to fluctuate, but remains near the average of all programs at Ferris State University. The official Productivity Report from the Office of Institutional Research and Testing dated 2003 – 2008, the average ratio of student credit hours to full time equated faculty (SCH/FTEF) of all programs is on the order of 450. [10] For the ITM program, the three years reported in the report indicate an average SCH/FTEF ratio of 389.7, which is lower than average, but remains viable as a standalone program.

Table XII
Administrative Data Report for the Industrial Technology & Management Program [7,8,10]

	Su 05	F 05	W 06	Su 06	F 06	Sp 07	Su 07	F 07	Sp 08	Su 08	F 08
Full Time Faculty (FTE)	0.0	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Overload/Supplemental FTEF	0.0	0.75	0.0	0.42	0.0	0.0	0.25	0.0	0.25	0.0	0.0
Adjunct FTEF	0.5	1.25	1.25	0.33	0.92	0.92	0.67	0.83	1.17	0.25	0.83
Student Credit Hours *	164	509	348	275	329	458	286	327	400	170	394
SCH / FTEF * - all courses		485.1			367.5			316.6			
SCH / FTEF – APPS only (reported)		207.1			182.7			214.5			
Enrollment – official	40	78	67	63	73	78	58	68	74	40	65
Enrollment – includes undeclared	47	110	117	71	103	96	60	86	98	40	71
Advising Load – estimated **	65	114	122	129	116	108	118	120	115	110	125
Degrees Conferred	5	11			13			21			4

* See footnote [1]

** See footnote [2]

[1] These values include the credit hours generated by a number of students designated as 'undeclared' in various colleges, or designated incorrectly taking program courses toward the degree program (Data extracted from BANNER - WebFocus reports in January of 2009). The official reports generated from the Office of Institutional Research and Testing represent only courses with the APPS prefix; it is notable that required program courses include those with prefixes of MFGE, MGMT and EHSM. A good majority of the courses in the program are taken at the community college partner sites with those respective institutions, so numbers generated in standard fashion do not represent fully the nature of credit hours generated by students in this program, while the total Ferris credit hours generated by these students is a better representation. When all Ferris courses are included, the numbers are much closer to the average ratio for all Ferris programs of 449.8 for the same reporting period.

[2] The estimated advising load includes students not currently enrolled in Ferris courses, but pursuing additional degree requirements with courses from community college partners.

C. Program Capacity

The estimated capacity of the program is approximately 80 students. This number represents two (2) full cohorts and two (2) partial cohorts of students, with a full cohort numbering 25 students. The rationale for this particular value is there would be a full cohort of students at both the Grand Rapids and Warren locations of the program, precisely the location of the respective offices of present full time faculty members. The 'partial' cohorts would represent students that do not desire to maintain a pace identical to their peers, thereby somewhat lagging behind in completion of the required sequence of courses in the program. Also included in the partial cohort would be students that may perhaps miss a course in the sequence and need to take this course the next time it is offered. It is also important to note that a number of students require continued advising once they have completed their course sequence with Ferris, often as they complete general education requirements at any number of community colleges statewide. Despite the fact that a student capacity of 80 appears low, it has been common practice to offer continued advising and "servicing" of students who are not enrolled in Ferris courses, as they work to complete their overall degree requirements. The numbers of additional advisees are noted in Table XI, and often this number approaches twice the number of actual students enrolled in any given semester, as indicated by the estimated advising load. This data is also presented in Figure 9, which displays the official reported program enrollment, the estimated advising load, and the number of full-time faculty members in the program. Given this information, the program in general has operated near capacity for the past number of years. Indications for the upcoming academic year (2009-2010) point to the number of enrolled students approaching or exceeding 100 enrolled students. As a consequence, the anticipated advising total load for students completing degree requirements could exceed 150 students.

The main factor which determines the program capacity is the number of full-time faculty members, currently numbering two. Enrollment in the program appears fairly strong, but classrooms have not been filled to capacity on a consistent basis. For the Summer and Fall semesters of 2009, indications point to at capacity or overcapacity classrooms at the Warren location.

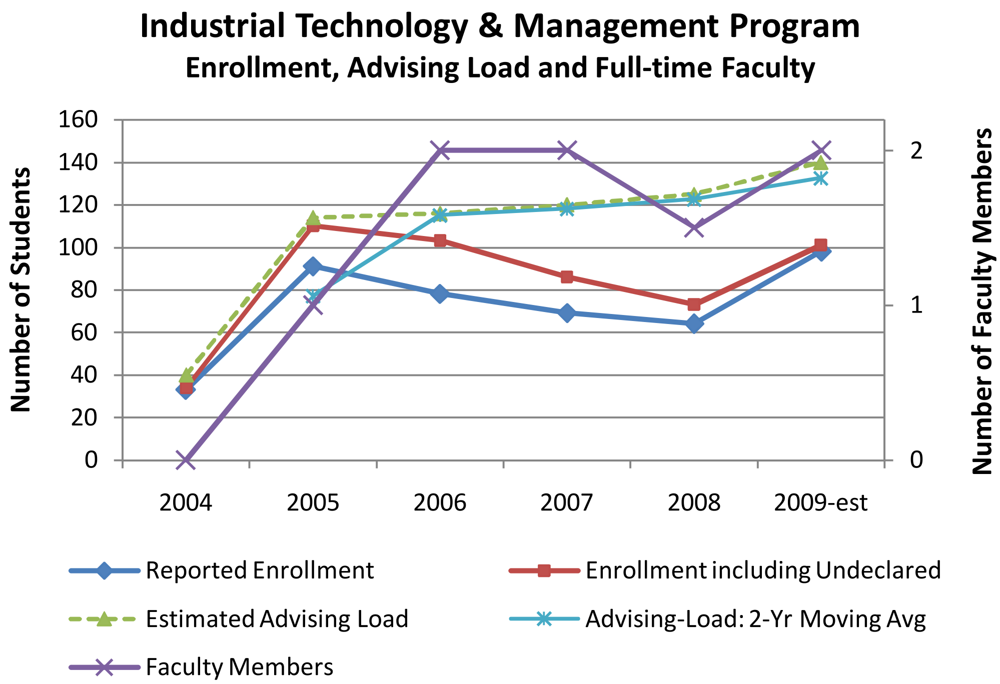

Figure 9: An illustration comparing the official student enrollment of students in the Industrial Technology and Management Program at Ferris State University for the 2004-2008 academic years, along with the course enrollment (including undeclared students) and the estimated advising load and the number of full-time faculty members in the program. Data obtained from [7].

Note: The faculty count for 2008 reflects one full time faculty member that left Ferris in mid-year. This individual was replaced for the start of calendar year 2009.

It should be noted that all students in the program require a significant amount of time for academic advising. This is due in a large part to the absence of program specific support staff at the remotes sites where the program is offered. Typically, full time faculty members (advisors) become the sole source of information and often the only Ferris contact with these students. It is commonplace for faculty members to address a great number of questions or concerns for students that are often addressed by other dedicated personnel on the Ferris Big Rapids campus. Examples of student questions or concerns addressed include, but are not limited to the following: course selection at a number of community colleges, financial aid matters, registration difficulties, purchasing of textbooks, FerrisConnect or MyFSU matters, common questions often addressed by the TAC office, student billing discrepancies, financial or other registration holds, career guidance, matters involving adjunct instructors, and others. In addition, the flexible nature of the degree program enables a wide distribution of prior college experiences for individual students in the program. In trying to service student needs, many of the ‘fine-print’ items of degree programs require a great deal more attention than those for full-time student on the Big Rapids campus. Included in these ‘fine-print’ items which often require significant time and attention are the 30 credit hours to satisfy the residency requirement and a minimum of 40 credit hours taken at the 300 and 400 levels. All these items collectively result in additional time and attention required for each student, especially in cases where the background of any given student might warrant a course substitution, leaving another degree requirement item unsatisfied. This matter will be addressed in greater detail beginning on Page 3-23, when matters of Faculty Workload are addressed. To illustrate this, the two-year moving average of the advising load is also displayed in Figure 9. Despite enrollment fluctuations, the advising load has continued to grow, due primarily to students seeking to complete their degree requirements, but not enrolling directly in courses from Ferris State University.

In addition to the common concerns of enrolled students, when dealing with prospective students, these same faculty members have been responsible for numerous matters of promotion of the program, including speaking with prospects, dealing with key personnel at community colleges, visits to pertinent industry sites, career fairs, and other matters that are often handled by dedicated marketing personnel. The Southeast Michigan Regional Office in Flint and the CPTS Grand Rapids office have offered assistance in some of these areas, but often common methods of recruiting transfer students have been unsuccessful. The primary reason for this is that the target population for the program does not ‘reside’ at high schools or community colleges, but typically have full-time positions in industry. The primary method of successful program promotion has been word-of-mouth with assistance from current students in the program. In addition to this being extremely challenging, it is unknown how to properly promote the program beyond this method. Promotion and marketing matters were addressed specifically earlier in Section 1 of this document.

D. Student Retention and Graduation

Using terminology specific to typical reports in the APR process, “retention” is perhaps not an accurate measure that can or should apply to the ITM program. Virtually all students in the program begin and finish as part-time students. There have been a variety of reasons for which students have dropped-out of the program sequence and these can be communicated to program faculty weeks in advance, or at the last minute before a semester begins. In a cohort model of enrollment, if a student happens to miss a course in the sequence, it is likely that their ultimate degree completion plans will be altered severely, as they will need to wait until a semester well into the future before being given the opportunity to take the missed course. For these reasons, perhaps the term 'retention' is not the best description of students that remain in the program. In the vast majority of cases, students that 'drop' the program have come to finish their requirements at some point in the future. The many reasons why students have not elected to take Ferris courses in any given semester as listed as follows:

- Students have lacked a prerequisite for one or more courses offered, and require delaying continuation of their sequence until the prerequisite course has been completed
- Students have previous college coursework that allows a substitute course for the only course offered that semester and do not enroll in specific Ferris courses during that particular semester
- The employer of the student has plans to send them on an extended assignment for several weeks and extensive travel does not allow them to take a course at that time
- The employer of the student has reduced or cut funding for higher education of its employees and the student is struggling to find ways of paying for their education
- The student has lost their job due to a downsizing effort and has no available funding to continue their education at that specific time

E. Access of the Program to Students

At one point over the past five years, it could perhaps be debated that the ITM program was one of the most accessible programs offered at Ferris State University. There were seven active off-campus locations, each offering courses in the program at evening times convenient to the student population. Some of the locations had very few students, namely, Dearborn, Port Huron and Delta College and as a consequence, very small sections were offered with eight or fewer students in each course. The same problem occurred when a second cohort was launched at the Muskegon location in the Fall of 2007. Despite tireless efforts to improve the student population with marketing and dedicated visits to the various locations, student enrollment at these locations remained low. A directive in March of 2008 from the CPTS Dean instructed the faculty to offer a greater portion of the classes via the Internet, in order to deal with the low enrollment numbers at these off-campus locations. The strategy was to tolerate low enrollments in certain courses, and combine all low cohorts into larger Internet sections to make the program more economically feasible. Including courses from other departments and general education courses, 20 credit hours of the required 34 credit hours of program courses from Ferris State University were available via the Internet. Despite these efforts, student enrollments at certain locations remained low, and in July of 2008, CPTS administrative personnel made a decision to cancel all cohorts except Grand Rapids and Warren, citing economic reasons.

F. Curriculum

The overall goals of the initial ITM program (2002) were stated as follows:

- A program for working adults with prior industrial experience
- A flexible curriculum which respects their knowledge of their prior studies, yet builds on this knowledge in topics relevant to the blend of engineering, business and management
- Evening course offerings which enables minimal conflicts with their current position

The Ideal ITM Student:

- Has an associate's degree in a technical or business related field
- Has at least five years of relevant employment experience in an industrial setting
- Wishes to advance their career and their opportunities by completing a 4-year degree program
- Typically will enroll in 5-6 credit hours per semester

The ITM program was developed as a truly niche program to serve the needs of working adult professionals, in order to enhance their credentials and offer better opportunities to advance their careers. The underlying philosophy of the approach to develop the degree was very different from that of a traditional student curriculum model. It was felt that with older students who possess a great deal of prior job experience, a more flexible degree program would serve their purposes better than that of a program designed with more rigid requirements for traditional younger students. The reasoning for this was two-fold; first, older non-traditional students already bring a wealth of life experiences at prior job training and experiences to their current positions as well as the to the classroom. In this manner, classroom coverage of topics could proceed deeper than it could for younger traditional students without the related experiences. Secondly, for older, experienced students, it is generally accepted that the precise degree a student obtains is less important than the fact that they obtained a degree. While a degree in 'any' subject would not be prudent, allowing a flexible degree program to enhance their careers with topical coverage for subjects in which they do not have direct textbook knowledge would be very beneficial.

In 2001 discussions ensued regarding specific course content and topical coverage in what would become the ITM program. Early in the process, the program was titled: *Manufacturing Technology – Industrial Controls Technology Concentration.* Following several adjustments, including a change in title and emphasis, the current curriculum was devised. Many of the courses in these early stages were developed solely by professionals in industry, without consultation with academic professionals. Although this approach was perhaps novel, it lacked forethought required in the true rigorous development of an academic program and discipline. On consultation with Big Rapids campus personnel on this program, there were a number of concerns that remained unaddressed at the time the program was approved and ultimately launched and offered to prospective students.

Personnel from UCEL played a key role in marketing the ITM program at various off-campus locations in these early stages. The program appeared to meet all the needs of specific students with a technical background, while needing baccalaureate level credentials. These efforts were very aggressive, and perhaps slightly premature. Cohorts had been launched at two off-campus sites with only experimental status of certain program courses, leading to a great deal of confusion on the part of students and adjunct instructors. Several adjustments were made in the program to offer a better focus of technology topics, rather than the Industrial Controls emphasis that was the initial thrust of the program. Courses were introduced in Computer Aided Design and Automation Technologies while removing courses specifically in the topic of Industrial Controls. Part of the reason this was performed was that these initial courses in the program were anticipated to be dropped by the Electrical and Electronics Engineering Technology (EEET) department, and the need was present to replace these courses.

When Dr. Andrew Purvis was hired in 2005, there was a need to give the program a better image and more focused overall direction. A logical sequence of the program courses was initiated, and prerequisites in the program were eventually adjusted to enable this in a more regular fashion. The suggested textbooks were adjusted and changed to better reflect the academic nature of the program. To ensure uniform coverage of courses state-wide, extensive 'adjunct packages' were developed and delivered to numerous adjuncts each semester. The vast majority of dedicated program courses were not developed by academic professionals, and required adjustments to meet the needs of both the program and the academic community within Ferris State University. While the assistance sought from industry professionals was well-intended, it would have been more prudent to consult extensively with academic personnel regarding this program earlier in the approval process.

Within six months of his hiring, an Advisory Panel was assembled and convened for an initial meeting to introduce the program, along with defining the role of the Advisory Panel. Once the Advisory Panel was assembled, a unified direction was established and the course charted to maintain this direction. The initial program outcomes consisted of four fairly vague statements, and together with input from the Advisory Panel, a skills matrix was developed which evolved into fourteen targeted and measureable Program Outcomes. In early 2006, rapid growth and expansion in the number of locations of the program necessitated the hiring of a second full-time faculty member and prior to the Fall semester in 2006, a second full-time faculty member was hired.

The original CPTS Charter and Omnibus Agreement specified that curriculum matters were to remain somewhat flexible and not subject to customary VPAA and Academic Senate oversight and review. Beginning in the Fall of 2005, this changed when the coordinator of the ITM program was appointed as the CPTS representative to the Academic Senate, and an understanding was attained with the CPTS Dean and VPAA that all future actions within CPTS programs would be subject to typical curriculum review procedures. The Program Coordinator was also appointed to the University Curriculum Committee as the CPTS representative in order to facilitate changes necessary in not only the ITM program, but other young programs within CPTS offerings. A curriculum adjustment in dropping an existing program course and creating a new course as its replacement was the first curriculum proposal to undergo the normal curriculum approval process through the Academic Senate.

Formal Curriculum Changes in the Program

November, 2004 – Course Replacement Due to Changes in Another Department

In the middle of 2004, the Electrical & Electronics Engineering Technology program announced adjustments in their curriculum, including dropping two courses from their program, EEET 201 and EEET 301. At the time, these courses were required in the fledgling ITM program, and the CPTS Administration initiated the first changes in the required courses in the program. Two new courses were introduced to replace the aforementioned courses.

A course in three-dimensional computer aided design was developed for the program, APPS 305, entitled 3-D Modeling and Prototyping. The course listed as a prerequisite MFGE 313, Computer Applications for Manufacturing. The goals of the course included introducing students to CAD technologies with parametric modeling, a fairly recent development in this technology which often uses software packages that are far easier to learn and use than more established and traditional CAD software. Another goal was to introduce students to rapid prototype development, a technique commonly in use in manufacturing facilities to create solid model concept components for ease of viewing. It was understood that a single course in this subject would not result in topic experts, but it was important to help the students understand the many concepts and idiosyncrasies of the field, including file formats, manipulations and design elements and the terminology associated with the CAD field. In this way, the student could ultimately communicate better with experts in this field and communicate the nature of CAD work to executive level management with sufficient knowledge of what is required in CAD drawings and in the discipline.

A second course developed to replace the courses eliminated by the EEET Program was APPS 350. This course was originally entitled "Automation Technology, Electrical and Mechanical Design." On consultation with assorted personnel with considerable knowledge in this field, it was determined that the topic was too broad to be encompassed in a single course. Following this, the course evolved slightly with more coverage of the business aspects of the automation field and was given a new title; Automation Technologies Management. The goals and focus of this course were to introduce students to the field of automation, along with provide tools and skills for managing automation projects. On completion of the course, the students would have the ability to justify the need for automation, understand and be able to apply existing automation technologies to specific industrial situations and be able to navigate the path for extensive capital investment projects of this nature for a facility.

January, 2007 – Course Change Due to Changes in Another Department

A course was replaced in the program core, due in large part to discussions in the Manufacturing Engineering Technology Department regarding the elimination of one of the required ITM courses. The course MFGE 313 was removed from the program due to informal conversations with the Manufacturing Engineering Technology Program. This particular course was targeted for phase out in the manufacturing curriculum as part of a larger curriculum revision. The ITM program replaced this course with a course more suitable to subsequent required courses in the program and very applicable to the eventual careers of the program students. A course in manufacturing standardization and certification numbered APPS 420 provided coverage more suitable to students in the program in their career preparation. The goals and focus of the course were to explore the field of standardization in industry through examination of existing and emerging standards, documentation and accrediting agencies. This quality management course was designed to explore such topics as ISO and TS Certification, standards that exist in the vast majority of manufacturing and industrial firms around the world. The course also explores the Malcomb Baldridge National Quality Award, and investigates the criteria and methodology for the award structure. Firms of both manufacturing and service were targeted for study. In addition, some of the many aspects of international requirements and certification of a far more stringent nature than those found in the United States were to be investigated in this new course.

January 2009 – Prerequisite Changes in Upper-Level Program Courses

A proposal was initiated that dictated a more firm course sequence in the program that was lacking since inception of the program in 2001. A number of prerequisites were dictated in the higher 400-level courses. Virtually all the enrolled students in the program are part-time, non-traditional students, and it was desired to have the more advanced courses in the program be reserved for those established students who have completed a number of the courses. It has been practice to encourage students to enroll in the program courses in a logical sequence of topics, and this proposal will make formal the intended sequence of courses in this program. A title change in the Capstone course will offer clarity for students in their selection of courses without any changes in content. In addition, deletion of ENGL 321 from the program writing options would allow for students to experience the type of writing they will experience in the work force, where this particular course does not fit this expectation as well as ENGL 311 or ENGL 325.

March 2009 – Adjustments in Admissions Criteria

Among the original criteria for program admission were the following:

- A minimum of 56 credit hours of prior college coursework
- An overall grade point average of 2.5 in previous college courses
- A grade point average of 2.5 in prior mathematics courses in college coursework

The program faculty felt that the mathematics GPA requirement was not relevant for students in the program. While other admissions requirements will remain unchanged, the mathematics restriction will be removed. The corresponding graduation requirement of a specific mathematics GPA requirement was also removed. One reason for this adjustment was there appeared to be no other academic program which requires a specific grade point average in topics outside the major or area of expertise, other than the general 2.0 FSU grade point average. In addition, there were two current courses in the program which require mathematics prerequisites, and the restriction made admission criteria consistent with the existing restrictions for these two courses (MFGE 341 and MFGE 423). The recent adjustment in restrictions for transfer credits did not allow credit for grades earned at other institutions lower than a C (2.0), so students who performed poorly in these particular courses would be required to repeat their mathematics sequence in order to complete the program requirements, including the prerequisites to other courses. In terms of whether this decision would jeopardize the success of students, there was no observed trend in current or previous students that previous mathematics grades were a predictor of either success or failure for the courses in question. Finally, the program faculty members wanted to stress the Ferris Mission of opportunity to extend admission to a few additional students who would otherwise qualify for admission to the program. In the case of transfer students, an undeclared status typically disqualified them from all types of financial aid.

Anticipated Future Directions of the Program Curricula

Future directions and possible changes in the ITM curriculum have been discussed on a number of occasions. The reasons for these discussions have been highly varied, such as job market changes, additional experience with the student population, exit interviews and from input from Advisory Panel. Regardless of the source of these discussions, dialog of this nature has allowed the program faculty to begin strategic efforts necessary for the long term success of the program and its students.

DROP EXISTING COURSE in 3-D MODELING, corresponding to course number APPS 305. It has been observed that about half the students enter the program with either sufficient or nearly sufficient CAD experience. The anticipated direction of the program also warrants eliminating this coverage as a requirement, as students will remain open to include this topic in their Related Electives category of total credit hours. A second option would be to require students to take coverage in this area from partner community college institutions.

ADJUST MANUFACTURING PROCESSES EMPHASIS: At present, a course taught by the Manufacturing Engineering department has exposed students to specific manufacturing processes, the strengths and limitations of each, along with offering certain aspects of the design process in overall selection of elements of manufacturing. The current required course in the program is MFGE 352. The vast majority of students entering the program have some exposure to this topic, although the previous exposure may be limited to specific topics such as welding or injection molding of plastics. While the program still has a need for knowledge in manufacturing processes, it is desired to offer more exposure and skill development in design elements. Specifically, the design process in the manufacturing sector typically involves far more than traditional processes, and as more industrial firms outsource many operations, it is desired to offer students the opportunity to gain skills in design elements. To bridge this gap in coverage, it is likely that a new course will be developed which encompasses pure design elements as these relate to needs of the customer and the function of the product or service. This coverage could be developed in conjunction with the needs of students in the MFGE program, and it is expected that discussions will occur regarding this adjustment in coverage.

IMPROVE COVERAGE IN MANAGERIAL FINANCE: The existing course sequence offers some limited coverage in topics of finance. A current course called Engineering Economics, MFGE 423, offers coverage in the time value of money and investments, depreciation, taxes, inflation, capital recovery and similar topics related to economic decision making in larger facilities. One option to increase this coverage would be to add an existing course in Managerial Finance from the College of Business to the program. However, this action would require a sequence of courses not required currently, including two courses in Accounting. It is hoped that additional topics could be covered in this discipline including basic cost accounting. It is likely that a dedicated course will be developed specifically for the target audience, in order to replace the existing course in the program.

ADJUST COVERAGE IN A SERIES OF COURSES TO INCLUDE: 'Lean Six-Sigma' coverage, as this relevant topic is necessary for advancement in industrial facilities. This matter was suggested by members of the Advisory Panel, given the business climate of the Industrial Sector.

CREDIT HOUR ADJUSTMENT: The category of "Related Electives" is to be standardized to 36 credit hours. At present, the range is 32 to 48, with Free Electives making up the difference, depending on the community college location. A Free Electives category is also to be made uniform, at 4 credit hours, which can be defined as virtually any course at the 100-level or higher in any subject. The existing range for this is from 0 to 8 credit hours at various locations. The existing credit hours within each category are slightly different at the various off-campus sites, as these details were negotiated with various community colleges from personnel of the former UCEL office.

SIGNIFICANT REFINEMENTS IN ON-LINE COURSES: This is expected to include the use of WebEX, which allows for voice recording and simulated 'live' lectures in common slide shows. The advantage to this specific package is that the resulting file sizes are very small compared to what was possible only a few years ago. In addition, it is also anticipated that a number of the existing courses will be explored for adjustment to allow a mixed-delivery format for the convenience of the nontraditional student population the program serves currently.

EMPHASIS TRACKS: The program is likely to be adjusted by adding one or more emphasis tracks; a 4-course sequence in related topics to offer the students flexibility along with matching their interests and career goals. Some of these emphasis tracks could be offered as existing Certificate Programs in various other Colleges throughout Ferris State University, including Business and Engineering Technology. In addition, specific emphasis tracks could be targeted for specific locations state-wide, in order to better serve those regions where a specific industry segment is perhaps in greater need of skills and personnel. The primary goals of developing and offering emphasis tracks such as this are to provide options not tied directly to the automotive manufacturing industry. The areas of emphasis track coverage being explored at present are offered in Table XIII below. Substantial input from members of the Advisory Panel, along with others within the Ferris community is anticipated.

Table XIII
Emphasis Track Areas Under Discussion Currently for Inclusion into the Industrial Technology and Management Program at Ferris State University in Order of Priority as of June 2009

Emphasis Track Title or Topic	*Supporting Notes*
Sustainable Manufacturing and Business	Environmental issues, resources, wastes and energy
Alternative Energy	Materials and components of emerging technologies
Chemical Technology and Processing	Continuous processes, reaction and transport
Quality Technology	Existing Certificate Program at Ferris State Univ.
Manufacturing Operations Management	Existing Certificate Program at Ferris State Univ.
Concrete Technology	Requested from one community college partner

G. Quality of Instruction

From the results obtained from the APR survey instruments, 83% of current students and program alumni indicated a highly favorable rating of instructors in the program. [10,11] Of the 17% of persons remaining, these individuals cited 1-3 instances where they did not feel the instructor(s) delivered high quality instruction, or a similar matter. In every instance, the students indicated a majority of their instructors were 'good' or better. The only notable matter with these results is that perhaps up to half the courses in the program are delivered by adjunct faculty members. A great deal of time and effort has gone into developing a pool of qualified adjuncts at various sites around the state, but without the luxury of being in the same location as the adjunct instructors at all times, it remains difficult to assess, evaluate, coach and mentor adjunct instructors. In cases where adjuncts have not been a good fit, they have generally not been asked to return to this role.

For Advisory Panel members, 85.7% of the respondents indicated that the ITM program prepared students well to enter the workforce. [12] The lone respondent that did not respond in a positive manner indicated a rating of "unable to judge." In related questions, members of the Panel were 100% in agreement that the ITM program allowed students to prepare for multiple career opportunities. In a question related to program strengths, a number of respondents indicated that the faculty members, both full-time and adjunct, were strengths in the program – citing the real-world experience of the faculty in particular. While none of the questions addressed the "quality of the faculty" specifically, these items do indicate a favorable rating to what is being taught and delivered in the ITM program.

Quality of Instruction Measurements

Evaluations are employed each semester using the Student Assessment of Instruction (SAI) instrument, and faculty members have used additional assessment surveys unique to the program. An example copy of the alternative instrument used in addition to the SAI is included at the end of this section of the report beginning on Page 3-72. Exit evaluations of graduating seniors have been used, as well as those pertinent for the Academic Program Review process for current students, alumni and employers.

Quality of Instruction Enhancement

Faculty members are encouraged to attend activities related to teaching improvement on a continuous basis. In addition to seminars offered by Ferris State University within the Faculty Center for Teaching and Learning, faculty members attend seminars and meetings of professional societies, relevant conferences and engage in both formal and informal research activities. Table XIV lists the specific activities undertaken by program faculty members from 2005 – 2009 in order to enhance teaching and classroom effectiveness. These activities are expected to continue as the program matures, allowing for continuous improvement of classroom delivery and outcomes quality for the benefit of both program students and Ferris State University.

Table XIV
List of Teaching Improvement Activities Undertaken by Faculty Members of The Industrial Technology and Management Program at Ferris State University from 2005 through 2009

Date(s)	*Faculty Member*	*Program*
Mar. 2005	Andrew Purvis	*Spring Learning Institute* – FCTL
May 2005	Andrew Purvis	*Getting Up to Speed with WebCT* – FCTL
June 2005	Andrew Purvis	*Rethinking College Teaching* – FCTL
Aug 2005	Andrew Purvis	*WebCT Course Development* – FCTL
Mar 2007	Andrew Purvis	*Spring Learning Institute* – FCTL
May 2007	Andrew Purvis	*Assessment Strategies in the Classroom* - FCTL
June 2007	Andrew Purvis	*Creating a Learner Centered Classroom* – FCTL
Dec 2007	Andrew Purvis	*FerrisConnect Block Training* – FCTL
Jan 2008	Sean Goffnett	Ferris*Connect Block Training* – FCTL
Mar 2008	Andrew Purvis	*Spring Learning Institute* – FCTL
Jan 2009	Andrew Purvis	Ferris*Connect Block Training* – FCTL
Jan 2009	Joseph Joyce	Ferris*Connect Block Training* – FCTL
Feb 2009	Andrew Purvis	*Faculty Learning Community – "SAI Blues"* – FCTL
April 2009	Andrew Purvis	*Spring Learning Institute* – FCTL (presenter)
May 2009	Joseph Joyce	*Conference: Scholarship of Teaching & Learning* (EMU)

Assessment of Student Performance

Students are assessed in a variety of ways in the program. Common classroom techniques, such as examinations, quizzes, research papers, projects, and presentations are used for the program. The Senior Project Capstone project culminates a student's studies and remains a major cumulative assessment of students in the program. A comprehensive assessment plan has been developed for the program, including rubrics for each of the 14 program outcomes. Additional details concerning the assessment plan of the program will be addressed in more detail in Section 3-K beginning on page 3-26 of this document.

Course Content Updates

Feedback is obtained from meetings of the Advisory Panel, from student surveys, industry discussions, community college partners, conferences and exit surveys. Appropriate adjustments in coverage, content or emphasis have been performed once the information is collected and delivered.

Success of Graduates

The success of graduates of the program is measured by their initial employment in the field within six months of graduation. Exit surveys have been a source of this input, and it is anticipated that additional follow-up will occur for graduates in the future. In the information available from the survey instruments of the APR process, 87.5% of program graduates received a full-time position within six months of graduation. [9] This figure is not as high as desired, but reflects a number of factors, primarily a soft economy in the industrial and manufacturing sector. Another matter which indicates success is the presence of program alumni in graduate programs of study. Of the 45 total ITM alumni, there are three (3) documented persons enrolled in graduate programs of study, primarily Master of Business Administration programs. From additional communication with program graduates, a number of others which did not return surveys are enrolled in other programs of study, including education. Among the institutions these graduates have reported or communicated for their studies include the University of Michigan, Western Michigan University, Michigan State University and Ferris State University.

H. HUMAN RESOURCES – FACULTY AND STAFF

Faculty

Dr. Andrew Purvis, Program Coordinator and Instructor, 2005
Ph.D. Materials Science and Engineering, University of Michigan

Joseph J. Joyce, Instructor and SE Michigan Advisor, 2008
M.B.A., Central Michigan University
Ph.D. (ABD) Industrial Technology, Eastern Michigan University

Adjunct Faculty

Brian Bodemann, 2008
B.S. Manufacturing Engineering Technology, Ferris State University

Kenneth Clark, 2008
M.S.A., Central Michigan University

Saleh Karsou, 2008
B.S. Mechanical Engineering, Kansas State University

Steven Landenberger, 2008
M.S. Industrial Engineering, Iowa State University

John Mola, 2007
M.B.A. University of Michigan - Flint

David Piggott, 2007
B.S. Manufacturing Engineering Technology, Ferris State University

Michael Raykhinstyen, 2007
M.S. Industrial Operations, Lawrence Technological University

James Smith, 2008
M.B.A., University of Michigan

Former Faculty

Dr. Sean Goffnett, Instructor, 2006-2008
Ph.D. Industrial Technology, Eastern Michigan University

Administration

Dr. Donald A. Green, Vice Chancellor and Dean, College of Professional and Technological Studies; Ed.D., Education, Western Michigan University

Tracy Powers, Assistant Dean, College of Professional and Technological Studies
M.Ed., Career & Technical Education, Ferris State University

Dr. Deborah Thalner, Executive Director, Southeast Michigan Region, College of Professional and Technological Studies; Ph.D., Educational Leadership, Western Michigan University.

Support Staff

Since mid-2007, one clerical support staff person is shared with the Assistant Dean's Office, three other dedicated CPTS academic programs and six other faculty members. Since late 2008, a second part-time clerical staff person has also shared these duties, along with part-time student workers. To some extent, these assistants also perform service functions to other academic programs offered in Grand Rapids, but housed on the Big Rapids campus. Two to three additional Ferris personnel at regional sites of CPTS offer additional periodic assistance in selected tasks.

The Advisory Panel and Its Structure

The Advisory Panel is comprised of volunteers from the business community, with unique interests in the program. This interest could originate from alumni status, or from interest in the discipline. From the beginning, it was a challenging task to assemble technical and business professionals for a newer program with virtually no track record or graduates. Initial discussions with participants resulted in a more informal Advisory Panel, rather than an elected or appointed Advisory Board. The participants expressed their desire to keep the organization informal and this request has been granted. As a result, the members of the Panel do not have designated terms, or a specific length of time they are to serve in this capacity. For the past four years, this structure has operated well, and there has been a consistent core of individuals willing to offer advice and direction to matters of the program. Formal recruiting of members is ongoing, and is expected to continue for the foreseeable future.

ADVISORY PANEL MEMBERS

Tom Boersma, Director, Technology Programs, Grand Rapids Community College, Grand Rapids, Michigan

Gideon Carlstrom*, Manager, Atek Medical, Grand Rapids, Michigan

Pete Eilers, Process Engineer, GHSP, Hart, Michigan

Scott Erdman, President, Erdman Machine Company, Whitehall, Michigan

Shawn Ferguson*, Field Technician, Southwestern Industries, Flat Rock, Michigan

Preston Kallemeyn, Engineering Manager, Steelcase, Inc., Grand Rapids, Michigan

Steve Landenberger, Quality Assurance Manager, Nelson Steel Products, Holland, Michigan

MaryAnne McCaffrey, Vice President of Human Resources, AMERIKAM, Grand Rapids, Michigan

Don Mulder, Managing Partner, Balanced Enterprise Solutions, LLC, Holland, Michigan

William Small, Innovation Director, The Right Place, Inc, Grand Rapids, Michigan

James Smith, Retired/General Motors, Warren, Michigan

Roger Spitz*, Gage Technician, Fisher Dynamics, St. Clair Shores, Michigan

Mike Sutton, General Manager, Michigan Freeze Pack, Hart, Michigan

Thomas Tom, Technology Leader, Johnson Technology, Muskegon, Michigan

* *ITM Program Alumni*

Advisory Panel Activities

Meetings for the Advisory Panel are held at least once per year in Grand Rapids, at Ferris State University. This diverse group has met to discuss the status of the program and to offer suggestions to ensure that the program direction remains current with the needs of manufacturing and technical management. Their guidance has resulted in adjustments to the curriculum, assistance in marketing efforts and visibility of the program. Despite being a newer academic program, attendance at these meetings generally exceeds 90%. This group of professionals was the first Advisory Group formed on the Grand Rapids Campus, and has served as a model for the Advisory Committees of other Grand Rapids based academic programs. A summary of meetings held and the primary focus of each respective meeting is offered in Table XV. Meetings have generally required four hours to complete the agenda. In addition, it is common to invite recent program graduates to meetings to present results from their experiences and findings from the Senior Project Capstone course. These volunteer efforts are appreciated from both the program and from the College of Professional and Technological Studies.

Table XV
A Summary of Meetings Held for the Advisory Panel of the Industrial Technology and Management Program at Ferris State University from 2005 - 2008

Meeting Date	*Primary Focus of Meeting*
August 2005	Program introduction and acquaintance
January 2006	Skill-sets obtained from the program
November 2006	Exploration of marketing and accreditation
August 2007	Possible curriculum adjustments in program
August 2008	Program assessment and APR planning

Faculty Workload

Both full-time temporary faculty members work a 12-month contract. The program coordinator is given 50% release-time for administrative duties, and otherwise is expected to teach six credit hours per semester. Up until 2009, in the summer months the program coordinator was given 100% release time, with the expectation that a substantial portion of time is spent on student recruiting and promotional activities. The Southeast Michigan instructor and advisor is expected to teach up 24 credit hours per calendar year, although these credit hours can be divided between all three semesters in the calendar year. Overload assignments are rare, although it has occurred on an as-needed basis. Table XVI displays a breakdown of expected tasks performed by the Program Coordinator for all typical assigned and anticipated duties.

Table XVI
Detailed Breakdown of Tasks Assigned to Program Coordinator of the Industrial Technology and Management Program at Ferris State University

Primary Category	*Tasks Included in This Category*	
Teaching	- Direct Classroom teaching - Course Preparation - Grading - Lesson Preparation	- Addressing student content concerns (office hrs) - Course Development (future semesters)
Advising	- Course selection matters - Admissions Decisions - Consultations with prospective students - Graduation Audits	- Drop/Add Overrides or Permission - Course transfer equivalency - Financial Aid Issues - Career Consultations
Program Administration	- Course schedules – statewide - Adjunct Instructor Matters - Textbook Matters - Student Grade Disputes - Program Curriculum Adjustments and Issues - Program Assessment Matters - Accreditation Matters	- Advisory Panel Matters - Program Promotion and Marketing - Faculty and Adjunct Mentoring - Faculty and Adjunct Evaluations - Articulation Agreement Issues - Course Equivalency Issues - Assorted Clerical Matters
CPTS Service	- Staff Meetings - CPTS Curriculum Committee - CPTS 'Dept. Chair' Meetings	- CPTS Curriculum Matters (other departments) - Other matters as assigned or directed
University Service	- Academic Senate - University Curriculum Committee - Other items as assigned or directed	
Academic Program Review	- Meetings of the Program Review Panel - Meeting Preparation	- Research - Writing and editing report - Consultations
Professional Development	- Specific Training Courses - Conferences - Meetings with Professional Organizations	- Enhancement of Credentials - Research
Professional Service	- Assorted Activities to Advance Profession - Peer Review of Papers or Articles - Matters of Community service or service to firms	
Transit Time	- Transportation in a vehicle to and from various sites while on University business	

Shown in Figure 10 is a breakdown of the hours spent by the Program Coordinator for the 2008-2009 academic year. [13] The illustration displays the breakdown of time spent in the various categories typically allocated to release time as well as typical teaching responsibilities.

The only specific item in the illustration that does not typically represent the time allocated to various duties is the time devoted to 'APR Matters,' for this item has been unique to the 2008-2009 academic year. For the Southeast Michigan Coordinator, the time spent has not been tracked as precisely, and would likely have fewer hours allocated to the Academic Program Review process, transit, and University Service. Other than these specific items, the approximate allocation of hours in other listed categories has been similar for the past number of years.

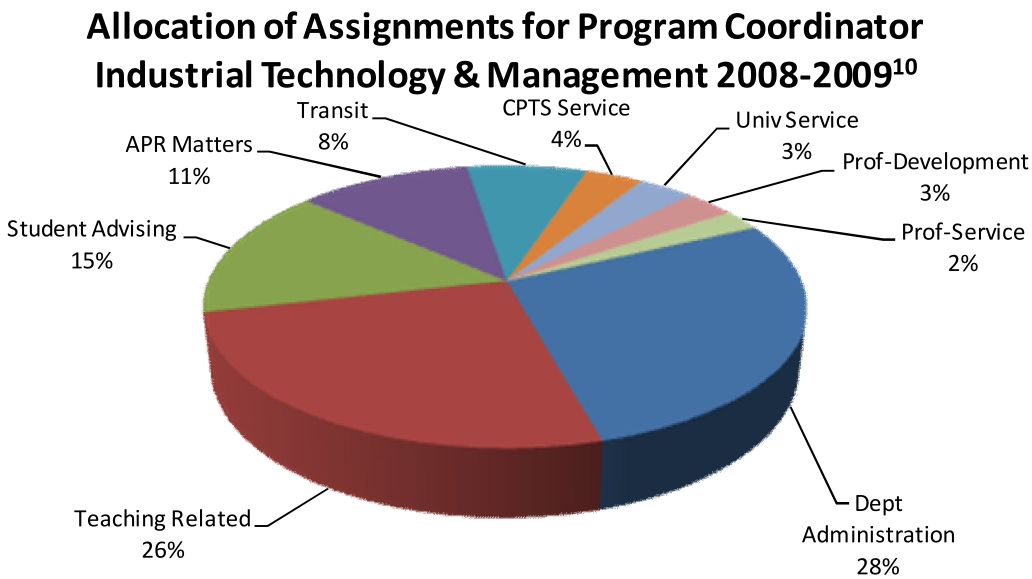

Figure 10: A distribution of the time spent by the Program Coordinator of Industrial Technology and Management at Ferris State University for various tasks during the 2008-2009 academic year. The teaching load displayed represents a 50% load, or six (6) credit hours per semester.

Faculty Recruitment

Recruiting of program faculty occurs on an as-needed basis. No additional faculty members are anticipated in the near future.

Orientation

This matter is not applicable to existing faculty members.

Reward Structure

This matter is not applicable to existing faculty members.

Graduate Instruction

This matter is not applicable to existing faculty members.

I. Service to Non-Majors

At present, there is a single course that is offered as a service course to non-ITM majors, and this course is not a general education course. The course APPS 301, Project Management, is required by two other programs within CPTS, Digital Animation and Game Design, and Digital Media Software Engineering. This course is one of the building-block courses of the ITM program, and offers preparation for the examination to become a Project Management Professional (PMP©). At present this is the only course, and only anticipated course to be required by other programs. This course is typically offered to approximately 15 students in these departments per academic year.

J. Degree Program Cost and Productivity Data

The Program Cost data was not available at the time of this document. There has been little history of the program, so no tracking has occurred within the Office for Institutional Research and Testing. The total cost of the degree program for prospective students becomes a difficult matter to track, for students arrive in the program with a wide array and volume of transfer credits, and hence, very different completion requirements.

Presented earlier on Page 3-6, Table XII shows the data obtained for the program from the Office of Institutional Research and Testing, along with some additional interpreted values that pertain specifically to this particular degree program. [7] Shown is the common information which pertains to student enrollment and the faculty members assigned to teach in the program. There are several notes of interest to this particular information, and a number of these are noted below the table. In addition, the faculty numbers assigned include full time faculty members in the program, and those adjunct faculty members assigned to teach program specific courses dedicated to program majors as assorted community college sites. For example, the Manufacturing Engineering Technology department has no students at the Warren, Michigan location, but MFGE 352 is offered only for the ITM students at this location. As a result, the adjunct faculty FTEF values reported in Table XII reflects those adjunct faculty members as well.

There are specific reasons why the faculty and Program Review Panel chose to include the generated student credit hours along with FTEF faculty values reported in Table XI on Page 3-6. The average student in the program enrolls in six credit hours per semester. Program courses include those with the prefix designations of APPS, along with additional select courses with the prefix designations EHSM, ENGL, MFGE and MGMT. In the program sequence, courses with the APPS designation represent a total of 24 credit hours, and 12 of these credits have been offered as substitute courses from assorted community colleges. In the professional sequence of courses for the average student, an additional 18 credit hours are offered by Ferris State University from designations other than APPS. In any given semester, a student could enroll in any number from six credit hours to zero credit hours of courses with the APPS designation, all while still enrolling in other dedicated program courses of the other prefix designations. In the reporting structure, this can lead to the appearance that the APPS courses and program in general produces far fewer student credit hours than other programs. Given the interdisciplinary nature of the program and the significant fraction of credit hours in the program which are offered by other departments, it could be considered a 'penalty' for dedicated APPS courses and the manner in which production is measured for the entire program. It is for this reason that reporting of credit hours generated by way of other departments are included in the reported information. The reported values which were computed in the standard manner are reported as well in Table XII.

K. Assessment and Evaluation

Program Accreditation

It is the intent of the ITM faculty to seek formal program accreditation through The Association of Technology, Management and Applied Engineering (ATMAE). The aforementioned organization has headquarters in Ann Arbor, Michigan, and offers individual certification credentials as well as academic program accreditation. This organization recently changed its name from the National Association of Industrial Technology. From their Internet web site, "The Association of Technology, Management, and Applied Engineering sets standards for academic program accreditation, personal certification, and professional development for educators and industry professionals involved in integrating technology, leadership and design and manufacturing. The Association of Technology, Management, and Applied Engineering (ATMAE) is faculty, students, and industry professionals dedicated to solving complex technological problems and developing the competitive technologist and applied engineering workforce." [14] The goals and structure of the ITM program fit well with the requirements of ATMAE accreditation, while association with other organizations, such as ABET, Inc., were judged inappropriate due to the program content.

It is anticipated that following the Academic Program Review process, the accreditation process will be undertaken by the ITM faculty and staff within the College of Professional and Technological Studies. The self-study documentation required in this process is nearly identical to that of the APR documentation, and adjustments can be made which are appropriate to the requirements of accreditation. The specific requirements of program content required by programs accredited by ATMAE are listed in Table XVII, along with the precise allocation of topical coverage present in the current ITM curriculum.

Table XVII
Guidelines for ATMAE Program Accreditation Compared with Existing Coverage in the Industrial Technology and Management Program [14]

Specific Topic	*ATMAE Requirements*	*ITM Program Credits*
Mathematics	6-18	6
Physical Sciences	6-18	7
Management	12-24	12
Technical	24-36	36-48
Electives	0-18	0-8
General Education*	18-36	28

Note: * - The listed 28 credit hours of General Education are exclusive of mathematics and sciences.

The Handbook of Accreditation for ATMAE gives broad definitions and guidelines for academic programs suitable for accreditation by this organization. The definition of Industrial Technology is stated as follows: [16]

> Industrial Technology is a field of study designed to prepare technical and/or technical management-oriented professionals for employment in business, industry, education, and government. Industrial Technology degree programs and professionals in Industrial Technology careers typically will be involved with the
>
> a) application of theories, concepts, and principles found in the humanities and the social and behavioral sciences, including a thorough grounding in communication skills.
> b) understanding of the theories and the ability to apply the principles and concepts of mathematics and science and the application of computer fundamentals.
> c) application of concepts derived from, and current skills developed in a variety of technical, engineering technology, technical management, and related disciplines.
> d) completion of a field of specialization, for example, graphics, construction, safety, manufacturing, automation, electronics, design, transportation, distribution, CAD.
>
> Four-year programs accredited in colleges and universities shall lead to the baccalaureate degree and shall be designed to prepare management-oriented technical professionals. Programs will include at least the junior and senior years of a baccalaureate program, with appropriate lower division course work from the four-year institution or from associated community colleges and/or technical institutes. Industrial Technology curricula which combine liberal education with

> professional-level technical management may be evaluated for accreditation at the baccalaureate degree level. Programs considered for accreditation must prepare students for technical and/or technical management positions in areas such as industrial planning, production, supply, product market research, technical sales, and/or other comparable fields.
>
> Examples of the names of typical programs which may be considered for accreditation, in addition to Industrial Technology, include the following: Manufacturing/Production Technology, CAD, Electronics Technology, Computer Technology, Packaging Technology, Construction Management, Manufacturing Systems, Industrial Distribution Technology, Aerospace/Aviation Technology, Engineering Management, or Engineering Technology.

Given this framework, the ITM program fits well for association with ATMAE. In general, external accreditation gives a defined level of achievement and standards for the program and these efforts are being received well by the CPTS administration. It is anticipated that achieving this status will assist in recruiting efforts, as well as publicity beyond Ferris State University. It will offer graduates of the program an ‘acceptance’ standard that could be difficult to define with the existing name of the program. The identity and visibility of the program will improve with this designation and Ferris State University will benefit from this as well. It should be noted that given the requirements, accreditation may not be possible using faculty with temporary status, and until this changes, efforts to pursue accreditation from ATMAE will be strictly exploratory. Other areas of concern which could potentially stall progress in the area of accreditation could be the lack of department-specific support staff for the program and the absence of a dedicated program budget.

Program Assessment

Initial conceptual documents of the ITM program included somewhat vague outcomes which were suited to the degree program, but lacking in a comprehensive plan for overall assessment. The ITM faculty, advisory panel and alumni have offered input for adjusting these outcomes, presented previously in Section 1. The intent of the assessment plan is to utilize a true ‘cycle’ in program assessment, where continuous feedback and adjustments will enable refinement in assessment methods and plans on a regular and periodic basis. Extensive program assessment is still somewhat in its infancy, and the stated outcomes and plans in place currently provide a starting point for future improvements. These efforts are ongoing and will continue to be refined as appropriate and necessary for continued improvement of the program. Figure 11 displays the intended process for improvement of the program using assessment data, as suggested by the ATMAE for accreditation, as well as for ongoing general assessment of a comprehensive assessment process of credible academic programs.

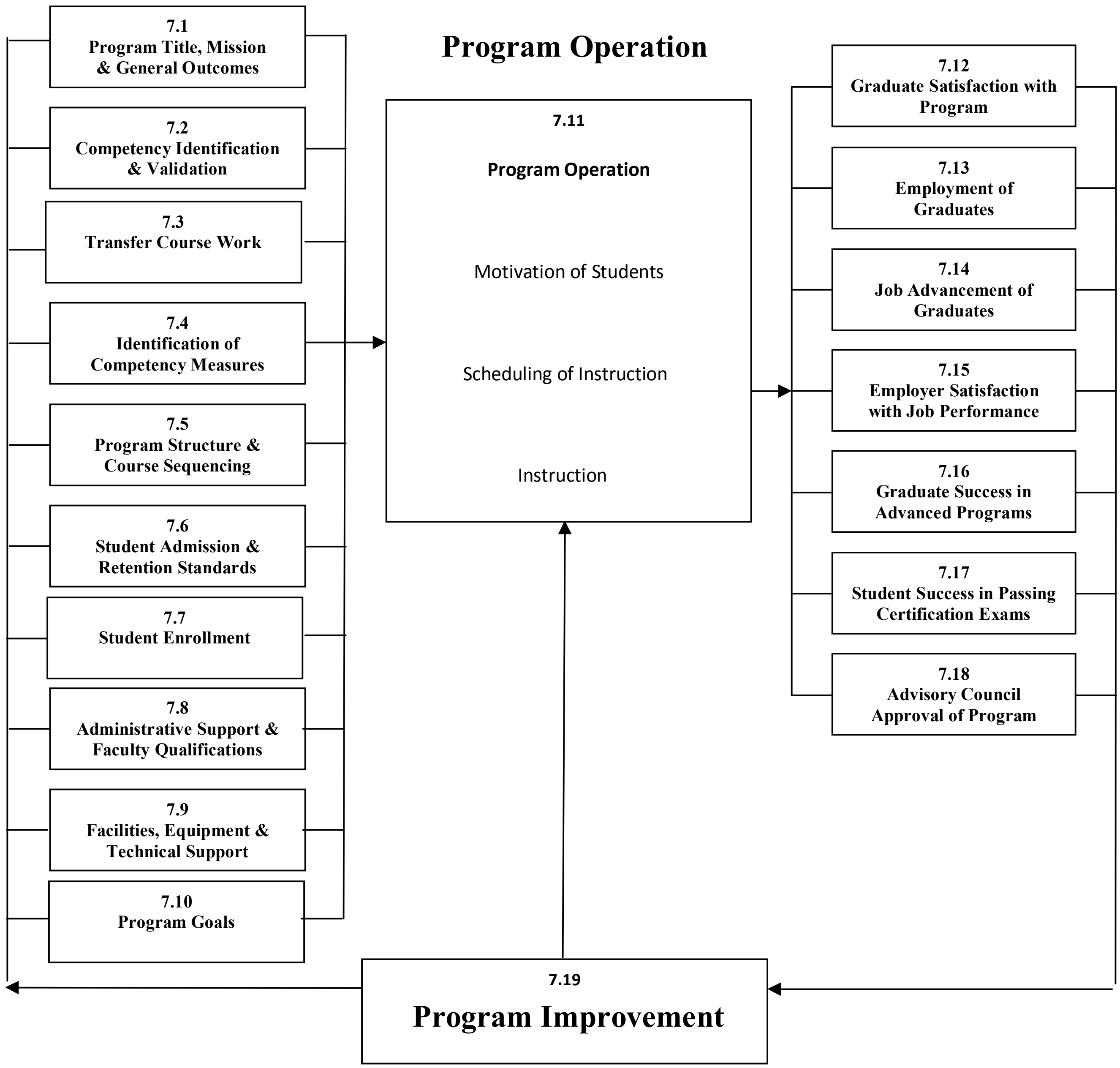

Figure 11: The anticipated cycle of assessment and program improvement for the Industrial Technology and Management Program. From [15]

While the diagram in Figure 11 appears mostly as common sense, it is important to note that only by execution of the continuous cycle of improvement and overall assessment plan will quality in the delivery of the program be ensured. In the beginning stages of the ITM program, not all these components were assembled, and it has taken time and considerable effort to put in action all the pieces required of any academic program.

The fourteen program outcomes are intended to be measured using comprehensive rubrics appropriate for each specific outcome statement. The existing rubrics are offered in supporting documents at the end of the current section of text. It is current practice to evaluate students and their progress on major course assignments. Currently, five (5) specific outcomes are used each semester, so that over the course of an 18 month time period, all outcomes are to be assessed. In addition, within this same time period, all students enrolled in the program will be tracked with assessment outcomes, and many of these students will be evaluated twice on some outcomes during the course of their professional sequence with Ferris. It is known that the current outcomes and assessment rubrics will undergo refinement and adjustment as additional data is collected. It is anticipated that by the next cycle in the Academic Program Review process, extensive assessment data will be in place and analyzed for appropriate program adjustments pertinent to the review process.

One outcome in particular will be highlighted in this report – Outcome number one (1). It is stated that students will be prepared to "Demonstrate competence and general knowledge by taking one of a number of examinations for certification; including but not limited to: Industrial Technologist, given by AMTAE, Project Management Professional, given by PMI, numerous possibilities given by ASQ, and Lean Certification, given by SME." It is strongly held that since the ITM degree program is not purely Business, and not purely Technology, that additional levels of credentials obtained by students would offer credibility and a needed status beyond the degree alone. The name Industrial Technology and Management does not often 'fit' within the names of more common degree programs, and offering professional certification of this nature certainly allows greater employment opportunities and job security for program graduates. While these examinations are optional for students, it is intended that publicizing the benefits of professional certification will become commonplace in the ITM classrooms.

The anticipated metric in Outcome 1 is to be the number of students that take and pass these examinations. At present, the program has a modest, but outstanding level of success in this area. To date, there have been two students that have taken examinations, and both have passed their respective test. One student was certified as a Project Management Professional by the Project Management Institute, and another student was named a Certified Quality Engineer by the American Society for Quality. Although the sample size remains small at this time, the rate of success is 100% for ITM graduates.

This specific outcome is to be incorporated into future promotional documents for the program, so that students will be able to see additional benefits from the program versus its competitors. The initial success of this activity is notable, but continued success by graduates of the program and the development of their external credentials is also a key factor for maintaining the ability to attract students to the program.

L. Administration Effectiveness

The ITM program at present has two faculty members, and shared clerical staff, while operating at two locations. One of these locations has no support staff or Ferris 'desk' where students and prospects can direct questions or concerns of a general nature. There are a number of challenges to this particular structure, and these can perhaps be best addressed by highlighting the strengths and weaknesses of the program in general.

PROGRAM STRENGTHS AND WEAKNESSES

Strengths

1. Strong presence of students at a number of off-campus locations
2. Strong interest in the program with potential students and employers of graduates of the program
3. Dedicated and qualified professionals in teaching and advising capacities
4. Strong partnerships with members of the Advisory Panel
5. A flexible curriculum to meet the needs of employers and students alike
6. A reputation that has gained steady momentum among students and potential employers of graduates
7. Partnerships with some community colleges are strong

Concerns and Areas for Improvement

1. Given the current state of the economy, the program suffers from a negative image associated with the automotive manufacturing industry. The design and content of the program is intended to fit virtually any industry, but the vast majority of current and former students remain entrenched in this struggling sector of the economy. In the State of Michigan, this is expected to remain a long term concern.

   Actions Taken to Mitigate this Concern

   Extensive discussions take place on a routine basis with key community college personnel regarding career paths for potential students in the program. Primarily through counselors, students can be offered career path options outside the automotive manufacturing industry.

2. The soft economy is anticipated to reduce the demand for available positions for program graduates. Given that the student population is to a large extent place-bound to their current place of residence, the absence of student mobility will remain a concern.

No action has been taken to mitigate this concern, however, monitoring the employment situation of graduates is ongoing, and action will be taken when deemed necessary and potentially effective.

3. Visibility of the program remains low, despite promotional efforts from UCEL, CPTS and program faculty. Since the program is not offered in Big Rapids on the Big Rapids campus, it becomes difficult for students to seek and find information unless they are fortunate to have an inside contact within the program.

   Actions Taken to Mitigate this Concern

   A. Developed semi-annual newsletter to highlight program, student and alumni success, along with offering general information for students and prospective students
   B. Additional literature for promotional purposes is under discussion.

4. Promotion of the program has been most successful by word-of-mouth from current students. Internet Web-pages of the program were developed in 2006, but were not included in the web-site update for the College of Professional and Technological Studies in 2008. As a result of this, applications to the program have dropped significantly over the past 18 months.

   Actions Taken to Mitigate this Concern
   Requests for reinstatement of program web-pages to assist in recruiting efforts have been discussed and improvements are forthcoming.

5. At present there are no tenure track faculty members. Both Instructors have full-time temporary status. Accreditation efforts can proceed only in an exploratory phase until a time in the near future when this is changed.

   At present there are no plans in place for this matter.

6. The official program enrollment figures reported by the Office of Institutional Research and Testing do not fully capture the number of 'semi-active' students in the program. Students in the program are primarily part-time students, and various issues can arise with course prerequisites, extended employment assignments away from home, financial matters, general education courses taken at community colleges and others often force students to drop out of their cohorts for several semesters at a time. Despite being declared as 'inactive' the students still require extensive advising and direction in order to complete their degree requirements.

   Actions Taken to Mitigate this Concern

   Realistic enrollment figures are presented in this document. Further discussion on this matter is anticipated.

7. Multiple locations for the same academic program require extensive oversight to ensure identical coverage of material state-wide. Adjunct instructors are typically given a 'turn-key' course with suggested coverage, assignments and assessments to ensure adequate and similar coverage in courses.

   Actions Taken to Mitigate this Concern

   Adjunct packages will continue and refinements of these packages are ongoing in order to make them more efficient.

8. Partnerships with certain community college sites have become “strained” due to uncertainties regarding the next anticipated cohort launch and the lack of a constant presence of Ferris at these sites for program promotion.

   Actions Taken to Mitigate this Concern

   Additional promotion on behalf of the Dean has warranted the need for additional travel to build and repair relationships with community college personnel.

9. The current admissions process to Ferris State University generally requires 4-6 weeks before a student can be admitted. Steps have been taken in an attempt to streamline this process, but the gains have been inconsistent. Competitor institutions have offered ‘Fast-Track’ admissions undeclared status either on-the-spot or within two weeks of the initial application, while the process with Ferris remains somewhat cumbersome. This disadvantage often leads students to seek their educational opportunities elsewhere, where it is perceived that attention to student needs is higher.

   Actions Taken to Mitigate this Concern

   The admissions process for all CPTS students has been centralized recently to the Big Rapids campus.

10. Due to the unique funding structure of the College of Professional and Technological Studies, the program has no dedicated budget.

    Actions Taken to Mitigate this Concern

    There are no plans within the CPTS administration to change this in the near future.

11. It is estimated that over the past 10 months (beginning in the summer of 2008), well over half the applicants to the program are displaced workers that receive State of Michigan or federal funding assistance to further their education. These programs, primarily the “No Worker Left Behind” act, require significant additional paperwork for financial aid and admissions, which places extensive strain on the available time of faculty members.

    Actions Taken to Mitigate this Concern

    There are no plans to transition any of the additional paperwork load for ‘unique’ admissions situations to personnel other than faculty at this time.

12. There are very few scholarships available to part-time transfer students, especially in off-campus locations. This leaves students seeking financial aid with very limited options for financing their education. The competitive disadvantage of this situation is expected to affect enrollments in the coming years, as has been demonstrated in recent months of the difficult economy.

    Actions Taken to Mitigate this Concern

    A scholarship fund has been initiated by CPTS, earmarked for students in the ITM program. At present, the fund is very small, and cannot support repeat awards. It is hoped that additional funding sources for this fund can be identified in the future, but at present very few options are available.

M. REFERENCES

[7] Ferris State University, Office of Institutional Research and Testing, "2003-2008 Productivity Report," (2008).

[8] Ferris State University, "WebFOCUS report – BANNER," (2008) Data extracted December 2008.

[9] Ferris State University, Office of Institutional Research and Testing, "Graduate Follow-Up Survey Report – 2005/2006," (2006).

[10] Ferris State University, Office of Institutional Research and Testing, "ITM Alumni Survey," (2009).

[11] Ferris State University, Office of Institutional Research and Testing, "ITM Student Survey," (2009).

[12] Ferris State University, Office of Institutional Research and Testing, "ITM Advisory Panel Survey," (2009).

[13] Purvis, A., *personal data file* (2008-2009), C://mydocs/administrative/time-category-tracking-Aug08.xls.

[14] National Association for Industrial Technology, (2008) "2009 Accreditation Handbook," NAIT (AMTAE), Ann Arbor, Michigan, P. 18.

[15] National Association for Industrial Technology, (2008) "2009 Accreditation Handbook," NAIT (AMTAE), Ann Arbor, Michigan, P. 1.

[16] National Association for Industrial Technology, (2008) "Outcomes Assessment Accreditation Model for Industrial Technology Programs," NAIT (AMTAE), Ann Arbor, MI, p. 2.

SECTION 3 ATTACHMENTS – Part 1

The following 40 pages include information regarding the program curricula, with blank versions of student checksheets, selected course syllabi, and other supporting documentation for reference and review.

FERRIS STATE UNIVERSITY

GRAND RAPIDS

Industrial Technology and Management, B.A.S.

Grand Rapids Community College (GRCC) Transfer Plan

The Industrial Technology and Management, B.A.S. degree is designed for persons involved in any one of a number of areas in manufacturing who may possess many manufacturing or business-related credits or an associate degree, and who desire a bachelor's degree. This degree program will assist persons who want to make a career change with their current employer or a career transition to a new employer. It is designed to assist persons who desire to work in production supervision, sales engineering, production planning, quality, engineering supervision, and project management among other positions. Employment experience of at least five years in a manufacturing or industrial environment is recommended. A large fraction of the program courses are offered on the Internet, so students should plan to enroll in Internet-delivered courses if electing this program.

Admission Requirements:

- Minimum credits for admission into the degree program will require at least 30 credits. In certain circumstances, individuals may be admitted into the program without prior earned credit due to the possession of prior experience or certifications that may lead to credit for prior learning. In addition, students will likely be enrolled concurrently at FSU-GR and Grand Rapids Community College. Admission with less than 30 credits will be by permission of the Dean.
- A 2.5 overall GPA is required for admission.
- All official college transcripts must be submitted at time of admission.
- To be considered for financial aid from Ferris, students must have earned an associate degree or 48 transferable semester hours and enroll in at least six credit hours each semester.

Required Courses		Course Title FSU Prerequisites Shown in Parentheses ( )	Internet Course?	GRCC Equivalent Courses	FSU S.H.	Grade
Concentration & Core Requirements						
1st Year Courses	APPS 301	Project Management		FSU class	3	
	APPS 305	Introduction to 3-D Modeling		See Advisor	3	
	MGMT 302	Organizational Behavior		BA 282	3	
	MFGE 352	Design for Manufacturing		FSU class	2	
1st or 2nd Year Courses	APPS 350	Automation Technologies and Management		FSU class	3	
	APPS 351	Production Flow and Plant Layout		FSU class	3	
	APPS 401	Contemporary Issues in Industrial Management	Yes	FSU class	3	
	EHSM 330	OSHA Laws and Regulations	Yes	FSU class	2	
2nd Year Courses	MFGE 341	Quality Science Statistics (MATH 116)		FSU class	3	
	MFGE 423	Engineering Economics (MATH 116)		FSU class	2	
	MGMT 370	Quality Operations Management	Yes	FSU class	3	
Final Year Courses	APPS 420	Manufacturing Certification and Standardization (APPS 301, APPS 350)	Mixed	FSU class	3	
	APPS 450	Manufacturing Improvement Management (APPS 351, APPS 401, MFGE 341)	Mixed	FSU class	3	
	APPS 499	Sr. Project Capstone (MFGE 352, MFGE 423, ENGL 311 or 325, MGMT 370)	Mixed	FSU class	2	
Total Concentration & Core Hours Required: 38						

Related Electives - Manufacturing or Business-related credits							
Courses in this category are typically taken from previous coursework at the community college level in fields relating to business, industrial topics, manufacturing or engineering, or from other sources, such as the U.S. Military or College-level Apprenticeship programs. Other options are available, and should be discussed with a Program Advisor.							
Course Number	*Institution*	*Credit Hrs*	*Grade*	*Course Number*	*Institution*	*Credit Hrs*	*Grade*
				TOTAL RELATED ELECTIVES CREDIT HOURS			
Related Electives Required: 48							

Revision Date: 07/02/09

General Education Requirements

Required Courses	Course Title FSU Prerequisites Shown in Parentheses ( )	GRCC Equivalent Courses	FSU S.H.	Grade
Communication Competence—12 Semester Hours Required				
COMM 121	Fundamentals of Public Speaking	COM 131	3	
ENGL 150	English 1	EN 101	3	
ENGL 250	English 2	EN 102	3	
Advanced Writing	ENGL 311 or 325 (ENGL 211 or 250) – *Internet Option is Available*	**FSU class**	3	
Scientific Understanding—7 Semester Hours Required				
PHYS 211	Introduction to Physics 1 (MATH 115)	PH 125	4	
Science Elective	Non-lab Science Elective - Select one course from the following areas: Astronomy, Biology, Chemistry, Geology, Physical Science, or Physics	GRCC	3-4	
Quantitative Skills—4 Semester Hours Required (see notes below)				
MATH 126	Algebra and Analytic Trigonometry	(MA 107 & MA 108) OR MA 131	3 / 2	
Cultural Enrichment—9 Semester Hours Required (see notes below)				
Elective Course	See notes below	GRCC	3	
Elective Course	See notes below	GRCC	3	
200-level Course	See notes below	GRCC	3	
Social Awareness—9 Semester Hours Required (see notes below)				
PSYC 150	Introduction to Psychology *(REG met)*	PY 201	3	
Elective Course	See notes below	GRCC	3	
200-level Course	See notes below	GRCC	3	
Minimum of 41 General Education Hours Required for FSU B.A.S. Degree				

NOTE: Courses with a GRCC equivalent are not taught at Ferris-Grand Rapids, therefore they must be completed at GRCC or another accredited college or university. Those planning on taking classes at GRCC must make application for admissions at GRCC and proceed through their registration and tuition billing processes.

NAME: ____________ **SS#:** ____________ **DATE:** ____________ **ADVISOR:** ____________________

Graduation Requirements:

- To graduate, students must have a 2.0 CUMULATIVE GPA in all FSU courses, and a 2.75 in the Concentration and Core (FSU courses).
- At least 30 FSU semester hours must be completed to fulfill FSU residency requirements.
- At least 40 semester hours must be completed at the 300 or 400 level.
- A minimum of 62 semester hours must be completed beyond the associate's degree for graduation.
- Students must meet the University General Education requirements.
- 127 credit hours are required for graduation.

Notes on General Education categories and courses:

- **Quantitative Skills** (Mathematics) - This requirement can be met by completing the Pre-calculus CLEP examination. Discuss this option with the Program Advisor.
- **Cultural Enrichment** - Select approved courses from the following subject areas: Art History, Art, Foreign Languages, History, Humanities, Literature, Music, Philosophy (except for Logic), Religion, or Theatre. Criteria: One 3-credit course in this category must transfer at the 200 level or higher. Also, students must choose from two different subject areas.
- **Social Awareness** – Select approved courses from the following subject areas: Anthropology, Economics, Political Science, Sociology, Psychology, Geography. One 3-credit course in this category must transfer at the 200 level or higher. One course in this category should also meet the 'Social Awareness Foundation' course requirements of Ferris State University General Education.
- One of the courses elected in either Cultural Enrichment or Social Awareness must also meet the "*Global Consciousness*" requirement (G) of Ferris State University General Education. One of the courses elected in any category must meet the "*Race, Ethnicity and Gender Sensitivity*" requirement (REG) of Ferris General Education – this course is typically selected from options in the Social Awareness category. Students should consult their advisor for verification of course selection for these requirements.
- The General Education distribution is a required element of any bachelor's degree program regardless of institution – students should anticipate completing all the listed requirements.
- Specific Equivalencies and general education designators for courses transferred from Community Colleges state-wide can be explored and referenced at the following link:

www.ferris.edu/admissions/Transfer/WebPages/homepage1.cfm

Industrial Technology and Management, B.A.S.
Macomb Community College
Degree Plan and Progress

Name:
SID:
Date:

Admission Requirements:

1. Minimum credits for admission into the degree program will require at least 48 transferable credits or an Associate Degree. In certain circumstances, individuals may be admitted into the program without prior earned credit at the discretion of the Dean. In addition, students should anticipate being enrolled concurrently at FSU and Macomb Community College.
2. A 2.5 overall GPA is required for admission.
3. All official college transcripts must be submitted at time of application for admission.
4. **To be considered for financial aid from Ferris, students must have earned 48 transferable semester hours or an associate degree and enroll in at least six credit hours each semester.**

Graduation Requirements:

1. To graduate, students must have a 2.0 CUMULATIVE GPA in all FSU courses and a 2.75 in the Concentration and Core (FSU courses).
2. At least 30 FSU semester hours must be completed to fulfill FSU residency requirements.
3. Students must meet the University General Education Hours requirements listed on page 2.
4. 125 credit hours are required for graduation.

Required Courses		Course Title FSU Prerequisites Shown in Parentheses ( )	Internet Course?	Macomb CC Equivalent Courses	FSU S.H.	Grade
1st Year Courses	APPS 301	Project Management (Jr. standing)		QUAL 2400	3	
	APPS 305	Introduction to 3-D Modeling & Prototyping		See Advisor	3	
	MGMT301	Principles of Management		MGMT 1010	3	
	MFGE 352	Design for Manufacturing		FSU class	2	
1st or 2nd Year Courses	APPS 350	Automation Technologies and Management		FSU class	3	
	APPS 351	Production Flow and Plant Layout		FSU class	3	
	APPS 401	Contemporary Issues in Industrial Management	Yes	FSU class	3	
	EHSM 330	OSHA Laws and Regulations	Yes	FSU class	2	
2nd Year Courses	MFGE 341	Quality Science Statistics (MATH 116)		FSU class	3	
	MFGE 423	Engineering Economics (MATH 116)		FSU class	2	
	MGMT 370	Quality Operations Management (Soph. standing)	Yes	FSU class	3	
Final Year Courses	APPS 420	Manufacturing Certification and Standardization (APPS 301, APPS 350)	Mixed	FSU class	3	
	APPS 450	Manufacturing Improvement Management (APPS 351, APPS 401, MFGE 341)	Mixed	FSU class	3	
	APPS 499	Sr. Project Capstone (MFGE 352, MFGE 423, ENGL 311 or 325, MGMT 370)	Mixed	FSU class	2	
Total Concentration & Core Hours Required: 38						

Related Electives – Manufacturing, Industrial or Business Related Topics

1. Credits may be fulfilled from courses within Macomb Community College Technology or Business program codes (prefixes: ACCT, ATBC, ATDD, ATEE, ATEM, ATFP, ATMT, ATPP, ATRA, ATSS, ATTR, ATWD, AUTO, BCOM, BUSN, CIVL, CLTC, CORE, DRAD, DRAS, DRBP, DRCG, DRSM, DRST, DRTF, DRVD, ECON, EETE, ELEC, ENGR, ENVS, INDT,ISUM, ITBS, ITCS,LMGT, MFGP, MGMT, MKTG, PRDE, QUAL, ROBO, WKBL)
2. Credits may be transferred from any accredited college, university or approved technical school

Course	School	Credits	Course	School	Credits	Course	School	Credits
	Subtotal			Subtotal			Total Credits	

Minimum Related Electives: 38

Free Electives

Free Electives: 5

Subtotal Credits: 79

General Education Requirements

Required Courses	Course Title	Pre-Requisite	Macomb CC Equiv Courses	CH	Sub. or Equiv.	CH	Gr
Communication Competence—12 Semester Hours Required							
COMM 121 or COMM 251	Fundamentals of Public Speaking or Argumentation and Debate		SPCH 1060 or SPCH 2500	3			
ENGL 150	English 1		ENGL 1180 or ENGL 1210	3-4			
ENGL 250 or ENGL 211	English 2 or Industrial & Career Writing	ENGL 1180 or ENGL 1210	ENGL1190 orENGL1220	3-4			
ENGL 311 or ENGL325	Advanced Technical Writing or Advanced Business Writing	ENGL1190 or ENGL1220	FSU class	3			
Scientific Understanding—7 Semester Hours Required • PHYS 1180 or equivalent from Macomb CC • Also Select any approved science course from the following subject areas: *Astronomy, Biology, Chemistry, Geology, Physics, Physical Science*							
Physics Lab	Introduction to Physics 1		PHYS 1180	4			
Scientific Understanding	Lab or Non-Lab Science		Macomb CC	3			
Quantitative Skills—4 Semester Hours Required							
MATH 126	Algebra and Analytic Trigonometry	MATH1000	MATH 1410 & MATH 1430	3 3			
Cultural Enrichment—9 Semester Hours Required							
Elective course	See notes below		Macomb CC	3			
Elective course	See notes below		Macomb CC	3			
200-level elective course	See notes below		Macomb CC	3			
Social Awareness—9 Semester Hours Required							
PSYC 150	Introduction to Psychology		PSYC 1010	4			
Elective course	See notes below		Macomb CC	3			
200-level elective course	See notes below		Macomb CC	3			
							General Education Hours: 46
							Total Credits: 125

Notes on General Education categories and courses:

- **Quantitative Skills** (Mathematics) - This requirement can be met by completing the Pre-calculus CLEP examination. Discuss this option with the Program Advisor. Students may also choose to elect either MATH 1450 or MATH 1460 from Macomb CC.
- **Cultural Enrichment** - Select approved courses from the following subject areas: Art History, Art, Foreign Languages, History, Humanities, Literature, Music, Philosophy (except for Logic), Religion, or Theatre. Criteria: One 3-credit course in this category must transfer at the 200 level or higher. Also, students must choose from two different subject areas.
- **Social Awareness** – Select approved courses from the following subject areas: Anthropology, Economics, Political Science, Sociology, Psychology, Geography. One 3-credit course in this category must transfer at the 200 level or higher. One course in this category should also meet the 'Social Awareness Foundation' course requirements of Ferris State University General Education.
- One of the courses elected in either Cultural Enrichment or Social Awareness must also meet the ***'Global Consciousness'*** requirement (G) of Ferris General Education. One of the courses elected in any category must meet the ***'Race, Ethnicity and Gender Sensitivity'*** requirement (REG) of Ferris General Education – this course is typically selected from options in the Social Awareness category. Students should consult their advisor for verification of course selection for these requirements.
- The General Education distribution is a required element of any bachelor's degree program regardless of institution – students should anticipate completing all the listed requirements.
- Specific Equivalencies and general education designators for courses transferred from Community Colleges state-wide can be explored and referenced at the following link:

www.ferris.edu/admissions/Transfer/WebPages/homepage1.cfm

Approved by: ______________________ ________ Approved by: ______________________ ________
Program Advisor Date Program Coordinator Date

Revised 07-16-09

COURSE SYLLABUS

PROJECT MANAGEMENT
APPS 301
Spring 2008

INSTRUCTOR: Andrew Purvis
616-233-3977
purvisa@ferris.edu

TEXTBOOK: **Project Management: The Managerial Process, (4th Edition)** C.F. Gray, E.W. Larson, McGraw-Hill, 2008; ISBN: 978-0-07-352515-0 (Includes CD-ROM plus MS Project software)

ADDITIONAL MATERIALS: Software included with the text – Microsoft Project
Handouts and additional readings will be provided

OFFICE HOURS: T/Th 3:30-5:00 PM or by appointment

COURSE OBJECTIVES:
1. Define the three common objectives to all projects.
2. Formulate criteria for project selection.
3. Propose project selection models, both numeric and non-numeric.
4. Select investment alternatives by calculating compound interest, present worth, future worth, rate of return, payback and risk as they apply to selecting investment alternatives.
5. Understand and predict the impact of cultural differences on project organizations.
6. Design a matrix and functional project organization.
7. Analyze and develop a project plan including the 9 basic elements.
8. Interpret the 4 points of principled negotiations.
9. Develop the work breakdown structure, Linear Responsibility Chart, and Project Action Plan.
10. Optimize a capital project budget and cash flow.
11. Estimate and level resources for a project.
12. Demonstrate basic knowledge of Project Planning Software for project development, monitoring and control.

EVALUATION PROCESS: Eleven (11) HOME WORK ASSIGNMENTS; One MAJOR PROJECT, JOURNAL NOTES, Two (2) EXAMS; ONE (1) FINAL EXAM, STUDENT "PARTICIPATION"

GRADING BREAKDOWN:

1. Homework Assignments: 11 @ ~20 points each	220 points	(22%)
2. Major project:	150 points	(15%)
3. Written journal notes:	150 points	(15%)
3. Exams: 2 @ 100 points each	200 points	(20%)

4. Final Exam: 150 points (15%)
5. Student participation & cooperation 130 points (13%)

Approximate Total 1000 points

COURSE GRADING SCALE:

1000 - 935 = A	934 - 900 = A-	899 - 870 = B+
869 - 835 = B	834 - 800 = B-	799 - 770 = C+
769 - 735 = C	734 - 700 = C-	699 - 670 = D+
669 - 635 = D	634 - 600 = D-	599 - 0 = F

Performance Standards/Policies:

1. Attendance. TBD

2. Tardy: TBD
3. Late Work: Assignments are due on the date scheduled in the syllabus AT THE BEGINNING OF THE CLASS. Should you have an exceptional situation, you may contact me to discuss a late submission. This should be done prior to the due date. Otherwise, the assignment will lose ten percent per day for each day late, up to three business days, then you will receive a zero on the assignment. If you miss a quiz/test, you must make arrangements to take it before the next class, or it will not be made up and a zero grade will result. Assignments submitted for grading will be returned to you in two weeks or less. Unacceptable quality of work will be handled one-on-one to try and figure out what the problem is, resulting in a possible resubmission of the assignment at a reduced grade.
4. Classroom Etiquette: TBD; Web surfing or working on other coursework during class periods is unacceptable. This is very distracting to other students and does not allow us to cover the material in as much depth as necessary. If you insist on doing this on everyone else's time, you will likely be asked to perform your work or "interests" in another room.

Academic Honesty

Ferris State University – Grand Rapids expects ethical behavior and a mature attitude toward learning for all students. Cheating, plagiarism and other forms of academic dishonesty are in violation of University policy and subject to disciplinary action.

"Cheating" includes, but is not limited to:

1. use of any unauthorized assistance in taking quizzes, tests, or examinations;
2. dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; or
3. the acquisition, without permission, of tests, images or other academic material belonging to another and without approval of the instructor.

"Plagiarism" includes, but is not limited to, the use by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgment. It also includes the unacknowledged use of materials prepared by another person or agency.

A student who has been found to be in violation of academic misconduct may receive a failing grade in the course and any of the disciplinary sanctions outlined in the Board of Trustees policy of student responsibilities, including suspension or dismissal from the university.

Ferris State University – Grand Rapids will have no tolerance with regard to cheating and/or plagiarizing. Instructors, for their part, will exercise care in the planning and supervision of academic work, so that honest effort will be positively encouraged. If an instructor discovers any instance of academic dishonesty, it is the instructor's responsibility to take appropriate action including reporting the incident to the appropriate Program Coordinator or the Assistant Dean of Academics.

1. For the first incident, FSU-GR reserves the right to dismiss the student from the school or take action appropriate to the situation. Should the student be retained, it is likely that student will receive a failing grade in the class and no longer be allowed to attend that class. The incident will be documented, the student will need to sign an admission of guilt or a document summarizing the infractions, and the documents are to be included in the student's file. Future instructors will be made aware of the incident to heighten awareness of the potential for reoccurrence. If the student maintains his/her innocence, the matter will be turned over to judicial services.

2. In the event of a second incident, the student will be dismissed from the program.

In the event that the student or instructor is dissatisfied with the decision of the Program Coordinator and Assistant Dean, either party may further appeal the decision to the Vice Chancellor/Dean. A cover letter with copies of the appeal, the instructor's response, and the decision must be submitted to the VC/Dean's office before an appeal will be considered. If the VC/Dean's decision is not satisfactory to one of the parties, it may be appealed to the Office of Student Judicial Services where all decisions will be final.

Note: Instructor reserves the right to make slight adjustments of the course, syllabus, schedule and student expectations as needed.

COURSE SYLLABUS

Production Flow and Plant Layout
APPS 351
Spring 2008

Course Description: This course utilizes the five principles of lean thinking (Value, Value Stream, Flow, Pull, and Perfection) to design or redesign a company's production flow and physical layout. The course will teach students ways to do more with less – less human effort, less equipment, less time, and less space – while coming closer to providing customers with exactly what they want.

Instructor: Andrew Purvis
171 ATC
616-233-3977
purvisa@ferris.edu

Office Hours: T/Th 3-5:00 PM or by appointment

Prerequisite skills and knowledge: None. Junior level status and some experience in a manufacturing environment is recommended.

Textbooks: Improving Production with Lean Thinking, J. Santos, R.A.Wysk, J.M.Torres, John Wiley & Sons, 2006, ISBN: 0-471-75486-2.

Value Stream Management, Eight Steps to Planning, Mapping and Sustaining Lean Improvements, D. Tapping, T. Luyster and T. Shuker, Productivity Press, 2002, ISBN: 1-56327-245-8.

Course Goals & Objectives: Upon completion of this course, students will be expected to apply lean thinking techniques in a manufacturing environment.

1. Allow students to know and understand different types of industrial facilities
2. Allow students to know and understand current methods in facility layout
3. Allow students to know and understand how to obtain resource requirements for typical or common processes in manufacturing operations
4. Know and understand the difference between customer requirements and manufacturing requirements
5. Understand the relationship between inputs and outputs of a manufacturing facility
6. Know how to perform a cost analysis on a common manufactured component
7. Understand the differences between traditional assembly line manufacturing techniques, specialty craft manufacturing and lean manufacturing
8. Understand the history of lean manufacturing
9. Be able to learn and identify different sources of manufacturing waste and be able to reduce or eliminate this waste
10. Have the ability to identify a value stream of a component and produce a value stream map

11. Understand the role of value-added and non-value added operations and floor space in a facility
12. Understand the role of optimization of location of various operations
13. Understand the various types of storage facilities, equipment and the functionality and utility of each
14. Be able to assemble the total resource requirements for a mid-sized manufacturing facility
15. Understand the role and requirements of support operations in a manufacturing facility

Course Assignments, Projects and Activities: All assignments should be approached with the intent of increasing your knowledge base of lean manufacturing. There is a wealth of information inside the assigned books. Read the assignments, share your experiences/ideas in class, do the projects, apply what you learn, and you will do well in this class and in your career.

1. Class participation and discussions (15%): (See below).
2. Tests (2 total, 10% each): Two mid-semester exams, each covering portions of the class material.
3. Facilities layout project and presentation (25%): This project may be done individually, or in small groups depending on the makeup of the class. The intent is for students to do a current state and future state value stream map of a real product from order to delivery. Other possible options for inclusion in the project will be Kaizen plans, layout adjustments, inclusion of manufacturing cells and similar topics. The project will also be presented to the class for evaluation and discussion. An extensive paper is involved to develop and justify the situation along with improvements made (or to be made) which make the situation more Lean. A one paragraph Executive Summary should be included that indicates the projected improvements or reduced muda (i.e. reduced inventory by 50%, improved throughput by 40%, reduced distanced traveled by 60%) with evidence to support your findings.
4. Homework Assignments (11 total, 25%): Generally, these are assigned problems or discussions from the textbook, or paragraph summaries to demonstrate your understanding of the course material.
5. Final exam (15%) Comprehensive.

The nature of the project and details for grading will be covered in a dedicated document.

Class Participation/etiquette: You will be expected to engage in class discussions. You should be prepared by having carefully read the assigned text before class, show up with talking points for discussion (see above), being attentive, respectful of others, provide constructive criticism, and ask questions when you do not understand something. The class will be more interesting and thought provoking when the entire class participates in the discussions. Also, it is encouraged to bring other interesting related materials to share for discussion.

Performance Standards/Policies:
1. Attendance. You need to come to class in order to fully learn and share your input. Please note, being absent is not an acceptable excuse for not being prepared when you return to

class. It is your responsibility to find out what you missed, so you can return to class prepared. Contact me, or a classmate, about what you missed.

Exceptions to the attendance policy.

2. A University-sponsored event in which an excused absence from the Vice President for Academic Affairs office is given.
3. Death of a family member or close personal relation (friends, neighbors).
4. Extended hospitalization.
5. Jury duty or being subpoenaed to testify in a court case.
6. Dangerous weather conditions in which driving is considered by local authorities to be unsafe.

2. Tardy: Students who are late for class more than twice will lose 100 points from their final total. I expect you to be on time. It can be very disruptive to be late.
3. Late Work: Assignments are due on the date scheduled in the syllabus, or as amended by the professor. Should you have an exceptional situation, you may contact me to discuss a late submission. This should be done prior to the due date. Otherwise, the assignment will lose ten percent per day for each day late. If you miss a quiz/test, you must make arrangements to take it before the next class, or it will not be made up and a zero grade will result. Assignments submitted for grading will be returned to you in two weeks or less. Unacceptable quality of work will be handled one-on-one to try and figure out what the problem is, resulting in a possible resubmission of the assignment at a reduced grade.

The total possible points in this course will be 1000. Your final point total will likely be less than this number. Final grades will be determined from the percentage of points earned, based on the grading scale provided below. There is no extra credit. Late work and resubmitted work will receive partial credit according to the policy explained above.

GPA	Letter Grade	Percent
4.0	A	93-100%
3.7	A-	90-92%
3.3	B+	86-89%
3.0	B	83-85%
2.7	B-	80-82%
2.3	C+	76-79%
2.0	C	73-75%
1.7	C-	70-72%
1.3	D+	66-69%
1.0	D	63-65%
0.7	D-	60-62%

A (Shows excellence). An “A” addresses the assignment clearly beyond what’s required, in an intelligent, perceptive, and thoughtful way, showing innovation and creativity. Work that receives an “A” demonstrates an original and thorough understanding of concepts related to the assignment. Such work shows that students have created a personal and meaningful understanding of the work for themselves that will influence how they think and act.

B (Strong). A "B" addresses the assignment beyond a satisfactory response and shows above average effort and thought with some signs of creativity.

C (Satisfactory). A "C" addresses only the basic assignment and is competent.

D (Weak). A "D" does not address the assignment, showing some but weak understanding and/or execution.

F (Failure). A "F" is not competent. Through misunderstanding, poor effort, or carelessness, it fails to meet the minimal requirements of the assignment.

I (Incomplete). Incompletes are granted for extenuating circumstances students don't have control over (i.e. birth, jury duty, death, injury, or military duty). Documentation may be required. Incompletes will only be granted for students who are making reasonable progress in the course, meaning a "C" average in at least 75% of all course work. A grade of "I" will automatically become an "F" prior to final exam week of the following semester.

Academic Dishonesty:

Ferris State University expects ethical behavior and a mature attitude toward learning for all students. Cheating, plagiarism and other forms of academic dishonesty are in violation of University policy and subject to disciplinary action.

"Cheating" includes, but is not limited to:

1. use of any unauthorized assistance in taking quizzes, tests, or examinations;
2. dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; or
3. the acquisition, without permission, of tests, images or other academic material belonging to another and without approval of the instructor.

"Plagiarism" includes, but is not limited to, the use by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgment. It also includes the unacknowledged use of materials prepared by another person or agency.

A student who has been found to be in violation of academic misconduct may receive a failing grade in the course and any of the disciplinary sanctions outlined in the Board of Trustees policy of student responsibilities, including suspension or dismissal from the university.

Ferris State University will have no tolerance with regard to cheating and/or plagiarizing. Instructors, for their part, will exercise care in the planning and supervision of academic work, so that honest effort will be positively encouraged. If an instructor discovers any instance of academic dishonesty, it is the instructor's responsibility to take appropriate action including reporting the incident to the appropriate Program Coordinator or the Assistant Dean of Academics.

1. For the first incident, FSU reserves the right to dismiss the student from the school or take action appropriate to the situation. Should the student be retained, it is likely that

student will receive a failing grade in the class and no longer be allowed to attend that class. The incident will be documented, the student will need to sign an admission of guilt or a document summarizing the infractions, and the documents are to be included in the student's file. Future instructors will be made aware of the incident to heighten awareness of the potential for reoccurrence. If the student maintains his/her innocence, the matter will be turned over to judicial services.

2. In the event of a second incident, the student will be dismissed from the program.

In the event that the student or instructor is dissatisfied with the decision of the Program Coordinator and Assistant Dean, either party may further appeal the decision to the Vice Chancellor/Dean. A cover letter with copies of the appeal, the instructor's response, and the decision must be submitted to the VC/Dean's office before an appeal will be considered. If the VC/Dean's decision is not satisfactory to one of the parties, it may be appealed to the Office of Student Judicial Services where all decisions will be final.

Note: Instructor reserves the right to make slight adjustments of the course, syllabus, schedule and student expectations as needed.

COURSE SYLLABUS

Contemporary Issues in Industrial Management
APPS 401
Fall 2007

COURSE DESCRIPTION:
Study the contemporary issues and challenges related to social, environmental, economic and political activity that effect North American manufacturing from a regional, national and world perspective. Current international competition from low cost countries/regions impacts industrial management at many levels. Course will explore the influence of global competition on manufacturing, competition, cultural bias and interaction skills. Case studies will be used to analyze how companies were affected and reacted in this environment.

CREDIT HOURS: Three Semester hours

CONTACT HRS: Lecture: 45 hours total; Laboratory: none

PREREQUISITE: Senior standing or permission of instructor.

INSTRUCTOR: Andrew Purvis, Instructor & ITM Program Advisor
EMAIL: **purvisa@ferris.edu (primary contact) – allow 24 hrs to respond**
PHONE: 616.233.3977 (office) T-TH
OFFICE: 171 ATC

OFFICE HOURS: On-line during scheduled class period or by appointment

TEXTBOOK & MATERIALS:
Engineering Management – Challenges in the New Millennium, C.M. Chang, Prentice-Hall, NJ, 2005.
First, Break All the Rules: What Today's Great Managers Do Differently, Marcus Buckingham, Curt Coffman, Simon & Shuster, 1999.
Harvard Business School Case Studies – available on-line for modest fee at http://harvardbusinessonline.hbsp.harvard.edu/b02/en/cases/cases_home.jhtml
Other assigned readings will be provided within FerrisConnect or will be available via FLITE (FSU Library system)

COURSE OBJECTIVES & OUTCOMES:
At the end of this course,
1. Students will understand how governmental forces impact multinational companies and businesses.
2. Students will develop an awareness and understanding of both the benefits and risks that low cost competition has created for US based industry.
3. Students will examine and understand the product and social responsibilities associated with global manufacturing.

EVALUATION PROCESS & GRADING BREAKDOWN:

1. Problem Sets / Assignments	(10%)
2. Weekly Quizzes	(20%)
3. Case Studies / Group Reports	(30%)
4. On-line Discussions / Participation	(40%)
	100%

Final grades will be determined from the percentage of points earned, based on the grading scale provided below. There is no extra credit. Late work and resubmitted work will receive partial credit according to the policy explained below.

GPA	Letter Grade	Percent
4.0	A	94-100%
3.7	A-	90-93%
3.3	B+	86-89%
3.0	B	83-85%
2.7	B-	80-82%
2.3	C+	76-79%
2.0	C	73-75%
1.7	C-	70-72%
1.3	D+	66-69%
1.0	D	63-65%
0.7	D-	60-62%

COMMENTS ON COURSE:

This particular course is unusual in that there is often more than one “correct” answer to any of the questions presented to you. Management in general is not a black-and-white topic, and depending on the situation, a solution to a problem may take you in one of several possible directions. The idea with all the material is to be able to reflect on the situation, make a judgment based on all of the stakeholders and then be able to act on that decision and justify it. We will often disagree in approaches, and that is perfectly acceptable. Keep this in mind as we proceed forward.

WEEKLY QUIZZES:

Each week, you will read from the textbook and review the lecture notes in FerrisConnect. You will then be required to take a quiz on the material, which covers the primary points in both the book and other readings. You are asked to work alone on this task – and since each quiz does not amount to a substantial amount of points, please use an honor system for monitoring your own work. While this cannot be policed extensively, pages within the FerrisConnect system can be tracked for access, which will point to “simultaneous” work on quizzes and other material. This WILL BE enforced, so please do everyone a favor and not “test” the system. Also bear in mind, that there will be no examinations other than the weekly quizzes and this includes no final exam, so I ask that you respect the system and your fellow students in this manner.

ON-LINE DISCUSSIONS:

A major portion of your grade will be bulletin board discussions on specific topics related to coverage in the course. Many times, you are posed a situation where you will need to make comments and post them on a bulletin board in FerrisConnect for all to read. You are then asked to read your classmate's comments and postings, and then comment on those. These postings have strict deadlines that will be enforced and meeting the deadlines will determine part of your grade. When the discussion has opened (generally on a Monday) you will have about 48 hours to pose your initial response to the question, then post follow up discussion items on at least two occasions beyond your initial posting. Obvious, the more postings you make, the better your grade will be. You need to also keep in mind that a simple posting of "I agree with him" is unacceptable, for this does not demonstrate any learning other than the fact you know how to make a posting. You should post and respond with at least a detailed paragraph that demonstrates your knowledge of the subject and the topic. The purpose of this is to demonstrate that you are keeping up with the material and are able to relate the course material to a real-world situation rather than a simple "spitting back" the textbook material in a classroom setting. Any additional support you can give for your position might include additional references – which will make your grade for the assignment higher. Many times you will be pre-assigned a role to play in the discussion and you should base your comments on this predetermined role so we can see all sides of an issue. The discussions are generally quite enjoyable and are designed to provoke a great deal of thought and reflection on the topics.

CASE STUDIES:
You and a small group of students are expected to read and be able to discuss a published case study on management issues. Two of these will be written up in a prescribed format, the final one be quite more detailed than the first. The purpose of the in-depth case study is to allow you to think about a topic related to the course in greater depth than offered by the lectures, reading or problem sets, to independently seek supporting information, to digest or expand or extend the ideas or work out numerous "what-if" scenarios. In all, we will have a total of three case study reports in this course – the first two are less rigorous and will give you an idea of what we expect before the end of the semester in-depth report. I should also hope that you teach your classmates (and me!) a thing or two in the process. The case study format and expectations are detailed in a separate document. The case study format and expectations are detailed in a separate document.

HOMEWORK / PROBLEM SETS:
Other than the weekly quizzes and discussions, there are only a few homework assignments. These will be generally written paragraphs you will submit as Word documents within FerrisConnect.

TEAMS / GROUP WORK:
Occasionally, teams will be required for case studies or other class work. Each team should not exceed 4 students each. In these cases, you will be assigned team members for your group by the instructor.

COURSE SCHEDULE: (See separate sheet)

PERFORMANCE STANDARDS/POLICY:
1. Class Attendance Policy – There is no attendance policy for this course but it does have some expectations of which you need to be aware. This is an on-line class and you are expected to login to the FerrisConnect course site at least three times per week. Here you can

obtain course news, view "lecture" notes, obtain additional links for reference, turn in homework assignments, take quizzes and have online discussions with bulletin boards for pertinent topics of interest in the course. The course is not self-directed, and has assignments with due dates and expectations similar to a face-to-face course setting. If you do not complete the assignments when they are due you can and will receive a zero for that assignment.

2. Late Work: Assignments are due on the date scheduled as specified in the syllabus and/or course schedule, or as amended by the professor. Should you have a special situation, you may contact me to discuss a late submission. This should be done prior to the due date. Otherwise, the assignment will lose twenty percent (20%) per day for each day late. Work that is more than a week late will not be accepted. If you miss a quiz/exam/test, you must make arrangements to take it before the next class, or it will not be made up and a zero grade will result. Assignments submitted for grading will be returned to you in two weeks or less. Unacceptable quality of work will be handled one-on-one to try and figure out what the problem is, resulting in a possible resubmission of the assignment at a reduced grade.

HONOR POLICY:
The student must maintain honesty and integrity on the work required for the course. If it is determined that any dishonest activity was performed by the student on a particular piece of required work, the student will receive a failing grade on that work. Ferris State University expects ethical behavior and a mature attitude toward learning for all students. Cheating, plagiarism and other forms of academic dishonesty are in violation of University policy and subject to disciplinary action.

ACADEMIC HONESTY:
Ferris State University – Grand Rapids expects ethical behavior and a mature attitude toward learning for all students. Cheating, plagiarism and other forms of academic dishonesty are in violation of University policy and subject to disciplinary action. For extensive writing assignments, your assignment will be submitted to Turnitin.com, a site which checks millions of reference articles for identical content and rates the paper you submit as to the likelihood any portion of it was plagiarized. Any incidents of plagiarism will be treated as cheating and your subsequent grade will suffer as a result.

"Cheating" includes, but is not limited to:

1. use of any unauthorized assistance in taking quizzes, tests, or examinations;
2. dependence upon the aid of sources beyond those authorized by the instructor in writing papers, preparing reports, solving problems, or carrying out other assignments; or
3. the acquisition, without permission, of tests, images or other academic material belonging to another and without approval of the instructor.

"Plagiarism" includes, but is not limited to, the use by paraphrase or direct quotation, of the published or unpublished work of another person without full and clear acknowledgment. It also includes the unacknowledged use of materials prepared by another person or agency.

A student who has been found to be in violation of academic misconduct may receive a failing grade in the course and any of the disciplinary sanctions outlined in the Board of Trustees policy of student responsibilities, including suspension or dismissal from the university.

Ferris State University – Grand Rapids will have no tolerance with regard to cheating and/or plagiarizing. Instructors, for their part, will exercise care in the planning and supervision of academic work, so that honest effort will be positively encouraged. If an instructor discovers any instance of academic dishonesty, it is the instructor's responsibility to take appropriate action including reporting the incident to the appropriate Program Coordinator or the Assistant Dean of Academics.

1. For the first incident, FSU-GR reserves the right to dismiss the student from the school or take action appropriate to the situation. Should the student be retained, it is likely that student will receive a failing grade in the class and no longer be allowed to attend that class. The incident will be documented, the student will need to sign an admission of guilt or a document summarizing the infractions, and the documents are to be included in the student's file. Future instructors will be made aware of the incident to heighten awareness of the potential for reoccurrence. If the student maintains his/her innocence, the matter will be turned over to judicial services.
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INSTRUCTOR DISCLAIMER:
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COURSE SYLLABUS
Manufacturing (Quality) Improvement Management
APPS 450
Fall 2007

COURSE DESCRIPTION:
Course is designed to prepare individuals for manufacturing operations leadership roles. Examines cutting-edge manufacturing processes including Lean Manufacturing, Total Quality Management, and Continuous Improvement. How to use techniques to help companies realize significant improvements in cycle times, customer service, throughput, inventory reduction, and reduced cost will be explored.

CREDIT HOURS: Three Semester hours

CONTACT HRS: Lecture: 45 hours total; Laboratory: none

PREREQUISITE: Senior standing or permission of instructor.

INSTRUCTOR: Dr. Andrew Purvis, Instructor & ITM Program Advisor
EMAIL: **purvisa@ferris.edu (primary contact) – allow 24 hrs to respond**
PHONE: 616.233.3977 (office) T-Th
OFFICE: 171 ATC
OFFICE HOURS: One (1) hour before and after class or by appointment

TEXTBOOK & MATERIALS:

Quality Management: Introduction to Total Quality Management for Production, Processing and Services, D. Goetsch and S. Davis, 5th Edition, Prentice-Hall, 2006, ISBN: 0-13-118929-8.

The Goal: A Process of On Going Improvement, E.M. Goldratt and J. Cox, 2nd Edition, North River Press, MA, ISBN: 0-88427-061-0. [or 3rd Edition]

Software
MS Office (Word, PowerPoint, Excel)
High-Speed Internet w/ access to course via WebCT

Statistical Calculator (e.g., TI-83)

SUPPLEMENTARY READINGS:

The Toyota Way. Liker, J. K., New York: McGraw-Hill, 2006.
The Machine that Changed the World. Womack, J. P., Jones, D. T., Roos, D., & Carpenter, D., New York: Macmillan Publishing Co., 1990.

COURSE OBJECTIVES & OUTCOMES:

1. Students will understand the need for, and practical application of, continuous improvement concepts by identifying and using appropriate tools in order to contribute to organizational goals.
2. Students will expand their leadership skills and knowledge of essential manufacturing components including work and production system analysis, process and project management, and quality systems.
3. Students will learn how to develop successful improvement teams through innovation management and employee involvement.

EVALUATION PROCESS & GRADING BREAKDOWN:

1. Attendance/Participation/In-Class Activities/Discussion/Reports	100 points (10%)
2. Problem Sets: 6 @ 50 points each	300 points (30%)
3. Unit Quizzes: 10 @15 points each	150 points (15%)
4. Midterm or Plant Tour	100 points (10%)
5. Project – Presentation Report [See Handout]	200 points (20%)
6. Final Exam	150 points (15%)
	1000 points

The total possible points in this course will be 1000. Your final point total will likely be less than this number. Final grades will be determined from the percentage of points earned, based on the grading scale provided below. There is no extra credit. Late work and resubmitted work will receive partial credit according to the policy explained below.

GPA	Letter Grade	Percent
4.0	A	93-100%
3.7	A-	90-92%
3.3	B+	86-89%
3.0	B	83-85%
2.7	B-	80-82%
2.3	C+	76-79%
2.0	C	73-75%
1.7	C-	70-72%
1.3	D+	66-69%
1.0	D	63-65%
0.7	D-	60-62%

CLASS PARTICIPATION/ETIQUETTE:

You will be expected to engage in class discussions. Many of these discussions will be held on-line in WebCT, which could include, but not limited to, discussions on textbook questions, presenting project findings, generating possible quiz questions, reviewing assignments, providing answers to specific questions from problem sets, and responding to any related questions that others may have. For each class, you should be prepared by having carefully read the assigned text beforehand, show up with talking points for discussion, being attentive, respectful of others, provide constructive criticism, and ask questions when you do not understand something. The class will be more interesting and thought provoking when the entire class participates in the discussions. Also, it is okay to bring other related materials and real-world examples to class to share.

PERFORMANCE STANDARDS/POLICY:

1. Attendance. There is no attendance policy for this course but it does have some expectations of which you need to be aware. This is an on-line class and you are expected to login to the FerrisConnect course site at least three times per week. Here you can obtain course news, view “lecture” notes, obtain additional links for reference, turn in homework assignments, take quizzes and have online discussions with bulletin boards for pertinent topics of interest in the course. The course is not self-directed, and has assignments with due dates and expectations similar to a face-to-face course setting. If you do not complete the assignments when they are due you can and will receive a zero for that assignment.

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3. the acquisition, without permission, of tests, images or other academic material belonging to another and without approval of the instructor.

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A student who has been found to be in violation of academic misconduct may receive a failing grade in the course and any of the disciplinary sanctions outlined in the Board of Trustees policy of student responsibilities, including suspension or dismissal from the university.

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INSTRUCTOR DISCLAIMER:
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COURSE SYLLABUS
Applied Science Capstone
APPS 499
Spring 2009

INSTRUCTOR: Andrew Purvis
616-643-5740
purvisa@ferris.edu

TEXTBOOK: None

ADDITIONAL MATERIALS: The following software suggested:
MS Office (Word, Excel, Powerpoint)
MS Project

COURSE OBJECTIVES:

1. Ability to write a concise managerial or technical strategic analysis of an existing or proposed organization.
2. Verification of mastery in prior course work.
3. Awareness of the competencies most required in the contemporary environment relevant to the student's concentration.
4. Synthesis of relevant data in the process of applied problem solving.

EVALUATION PROCESS: Ten Home Work Progress Assignments, One Major Project, Discussions and feedback for your classmates

GENERAL STATEMENT:
This course is unlike any other you have taken in your degree program. It brings together most every major subject you have studied in a single major project. The general idea is that you will solve a real-world problem or issue in an organization and take complete control of the solution. You will make regular reports to your classmates on your progress and learn information and techniques which assist in dealing with similar projects in the workplace on an everyday basis. The idea is to prepare you for situations and give you the preparation necessary to handle problem solving at a higher and more in-depth capacity than you have likely been accustomed in the past.

Performance Standards/Policies:

1. <u>Frequency of On Line Activity:</u> You will be expected to login to FerrisConnect at least two times per week. Here you will submit basic assignments, progress reports and give comments, suggestions and feedback to your fellow cyber classmates, and read their feedback and comments on your own progress. The majority of the assignments are designed to build your final paper, so that by the end of the summer, you will have completed and adjusted it to a final form. It is hoped that the majority of comments be made in "public" discussion form rather than private emails, because one idea from one classmate to another might spark some other interest and work on a different project. The only way to grade a course such as this is to heavily weight the deadlines for progress reports and include discussion and feedback to your classmates as part of what would be "in-class" discussion time. Please be diligent with this and you will be rewarded in the end. There will also be times where interesting and pertinent research

information is posted for you to view and make comments, as to how it pertains to your own project, as well as some else's project.

2. Detail of On Line Participation: You are expected to give constructive, useful feedback to your fellow students by participating in extensive bulletin board style discussions on FerrisConnect. With this you should show that time, thought and energy went into your responses – a simple "looks good" or "I agree with that approach" does not tell anyone anything. You need to find ways to give lots and lots of detail in your responses – in this way I can gage your depth of knowledge in a number of areas (which is part of the evaluation criteria for this course; to demonstrate competence in ALL subject areas in the program). Providing references, personal experiences or other ammunition to support your position is always a good thing and encouraged. Please do NOT feel you need to agree with the instructor on all points made – in fact, it would be good to show some dissention once in a while, provided you can back up your claims with references, we all might learn something…

3. Late Work: Assignments are due on the date scheduled in the syllabus, or as amended by the professor. Should you have an exceptional situation, you may contact me to discuss a late submission. This should be done prior to the due date. Otherwise, the assignment will lose ten percent per day for each day late, up to three business days, then you will receive a zero on the assignment. Unacceptable quality of work will be handled one-on-one to try and figure out what the problem is, resulting in a possible resubmission of the assignment at a reduced grade.

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Note: Instructor reserves the right to make slight adjustments of the course, syllabus, schedule and student expectations as needed.

APPS 499 Capstone Course – Senior Project Expectations

Senior Project

The Industrial Technology and Management curriculum requires that all graduates receiving their degree complete a Capstone Experience course (APPS 499). Many students are unaware of what this requirement will demand of them, and some fail to receive their degrees because of a lack of understanding of what is expected. The following suggestions are intended to assist current students who are approaching the end of their ITM program to successfully complete their senior project and earn their degree.

Get the proper orientation

The capstone project is not "just another course." Writing a senior project is not "just a big term paper." Doing a senior project will require you to do three things: 1) gather data, 2) analyze data, and 3) write a report based on the analysis of the data. For most students, these are unfamiliar tasks. Your first task in the APPS 499 Capstone Course is to prepare your project proposal. Your proposal is essentially a start-to-finish "roadmap" of what you will do in carrying out your project. It needs to be sufficiently detailed so that when you start your project, you will know exactly who is involved, what you are going to do, when you are going to do it, and how you are going to do it. The proposal you produce in the course is the foundation for a culminating academic exercise. You will be expected to write an academic/technical report on your project when it is completed. Done well, you may have the opportunity to take the finished project and modify it (with the assistance of your faculty advisor) into a publishable article.

Think ahead

Well in advance of enrolling in APPS 499, you should have one or more ideas about what you might do for your senior project. APPS 499 is not about spending ten weeks deciding on a topic and the remaining five weeks executing the project. The course is about executing your proposal and carrying out the work. Your decision about what you want to do actually occurs prior to enrollment of the course. The remainder of the course is devoted to helping you plan what you are going to do, when you are going to do it, how you are going to do it, and who might be involved. A problem statement needs to be created. Research questions and/or hypotheses need to be created. Assumptions and limitations must be considered. A literature review needs to be conducted. Data collection processes need to be described. Data analysis procedures need to be determined. Many students find that this is a lot to get done before a course even begins, so having a head start is a good idea.

Use your experience/company contacts

The most common barrier encountered in completing a senior project is gaining access to the required data. The answer may be your current company. Explore opportunities within your current employment setting. Brainstorm with supervisors, co-workers, and subordinates about your topic. Start asking questions about who you must get permission from in order to access the data you will need to carry out the senior project you have in mind. A letter of permission granting access to the required data should be included in the appendix to your proposal. Without data, you can't carry out your project. Without those data, you don't really have a proposal. If you are stuck completely and do not know where to begin, your advisor can offer some assistance in getting you started and/or project ideas.

Expect delays

No matter how good a job you do in your proposal in preparing your roadmap to complete your senior project, the real world will put some roadblocks in your path. How many you encounter depends on how good your proposal is. If you have a good proposal, the barriers encountered will be relatively few, you will have the time and energy to deal with these difficulties successfully, and you will be able to get back on track to completion. If you do not prepare a good proposal, you will encounter a great many obstacles, overcoming them will be costly in time and energy expended, and a longer time to complete the senior project can be expected. With a poor proposal, you can expect to abandon your senior project entirely, and never get your degree.

Success requires self-discipline

While enrolled in APPS 499, you will only be required to make periodic reports. You will not be required to come to campus on a regular basis to contact your senior project advisor. You are on your own, and you will be expected to assume responsibility for staying on task, staying on schedule, and making and keeping your own appointments with your senior project advisor. After years of being told what to do, and when to do it, many students have a great deal of difficulty dealing with this freedom. In many ways, this is a "test" to demonstrate the functions as a working professional, or if you still have the mental attitude of a student. Working professionals are capable of self-discipline and independent activity. The senior project experience should be an opportunity for you to demonstrate that you are capable of independent work. You will put in a lot of effort, but you will acquire valuable experience in a supervised environment, and gain self-confidence as a reward. This is a good position from which to advance your career.

Overall, you should expect to spend at least 60 hours on this project, perhaps as much as 100 hours. With the proper planning, you can minimize redundancy of tasks and be ahead of the game at the end of the semester. The ITM faculty looks forward to working with each of you in accomplishing the necessary steps and tasks, from preparing a proposal through to successful completion of your senior project, and achieving the goal of graduating with a degree from Ferris State University – Grand Rapids, Industrial Technology and Management Department.

The Proposal

The senior project is an integrative applied research learning experience that demonstrates competence in technological studies. More specifically, students are expected to apply the full range of concepts, knowledge, and skills acquired from their university experience. The senior project is generally a one-semester activity; however, a project proposal should be developed prior to enrollment in the course APPS 499. Before obtaining a magic number and enrolling in APPS 499, a Senior Project Proposal must be filed with the department office. The proposal can be developed collaboratively with a project sponsor or sponsors (not necessarily the academic advisor) and can be another member of the faculty or someone from business and industry. The role of a sponsor is to provide consultation and/or subject matter expertise upon request. The proposal should be submitted to the advisor, project sponsor, and program coordinator for approval using the outline shown on the attached form. Proposals should be no longer than 3-4 typewritten pages in length. The original proposal will be placed in the student's advising folder. A copy of each project proposal will be posted on the department bulletin board during the semester for viewing by interested Industrial Technology and Management students and faculty.

The proposal must be fully completed with sufficient detail to adequately describe the project and include the following:

1) the purpose of the project
2) the methodology to be used in completing the project
3) all required resources
4) deliverables
5) targeted milestones.

The purpose of the proposal is to verify that:

- The project has been carefully studied and analyzed before committing a great deal of time and effort.
- There is no misunderstanding between the student and faculty sponsor concerning what is expected regarding the project.
- You have the necessary coverage in the topics of mathematics (data collections and analysis), organizational processes (project management and execution), general management and economics, quality control or quality assurance (generally a manufacturing scenario), and application of technology or computers in your execution of the project. Remember, with this project, you are justifying your overall degree and your mastery of knowledge obtained in your coursework and the ability to apply that knowledge in your position.
- The project can be completed within given constraints.

Description and Purpose of the Project: Describe the project and its purpose in detail. One of the most difficult phases of a senior project is the choice of a suitable problem. Avoid selecting a project that is too broad in scope or too complicated to complete with the available resources within the allotted time. Select a project that is of personal interest.

Methodology: Describe the methods and procedures that will be used during the project. Careful thought and detailing of the procedures will greatly increase the likelihood of the project to be completed in an expeditious and enjoyable manner.

Resources: Include a description list of the materials and equipment (including software) necessary to complete the project. In addition, indicate if the resources are available on campus or how you plan to obtain them.

Deliverables: Develop a list of deliverables or expected outcomes (reports, software, charts, photos, presentations, etc.) for the project. This will assist in determining the viability of the project. Each project shall include a technical research component and a reporting component. Projects may be conceptual, developmental, or applied in nature. Successful projects generally include research combined with a practical experience and a technical write-up. The exact deliverables are subject to negotiation with the faculty sponsor and department chair, but shall always include research and a technical report. The research, practical experience, and report may be weighted differently depending on the scope of the project.

All project reports shall be written using APA format. Each completed project will be presented via colloquium to the faculty advisor, sponsor, department chair, and interested University faculty and students. This colloquium will be scheduled at the end of each semester for those students completing their senior projects.

Progress Reporting: To help guide and maintain progress toward completion of the project, it is necessary to identify significant milestones with accompanying target dates. Progress reporting and a schedule should be developed and negotiated with the project advisor. Projects not completed during the semester of enrollment will be graded as incomplete until all deliverables are submitted. Projects that are not completed within two semesters shall be considered abandoned and graded as failed.

It is the responsibility of the student to:

- identify and plan the project.
- provide or negotiate for all required costs.
- submit two typewritten copies of the final technical report with supporting project evidence.

Progress Log

The student should maintain an engineering logbook that will show day-to-day progress on the project. The log book should include any work associated with the project such as, but not limited to, conceptual ideas, design sketches, calculations, technical references, professional contacts, component sources, software information, etc. The logbook should be dated and signed. The purpose of this is to demonstrate organizational skills along with providing evidence of consistent progress, in the case where an incomplete in the course might be justified, or adjustment of the project scope while in progress. The log book can be hand written (as long as it is legible), or a collection of typed pages with organized notes in a binder.

1. A thorough literature search should be conducted to find information pertinent to the project. Additionally, a patent search should be conducted when appropriate.
2. The student may be expected to make a 15-20 minute oral presentation to the department faculty and fellow students at mid-term to provide a progress update and receive feedback.
3. The student is required to submit a rough draft of the final report to their instructor or advisor 2-3 weeks prior to the end of the semester.
4. The student should submit the final report at least a week before the end of the semester. The average length of a senior capstone report is 20 to 30 pages. Two copies of the report and drawings are required, one for the department and one to be returned to the student with the final grade.
5. The student will make an oral presentation to department faculty and students during the final exam week of the semester. The student will be allocated about twenty minutes for the presentation followed by a ten-minute question and answer period.
6. The final grade for the senior design project course will be determined by the following factors:
   a) Quality and magnitude of work.
   b) The extent to which material learned from the vast majority of program courses is present
   c) Log book.
   d) Final report.
   e) Oral presentation.

SENIOR PROJECT PROPOSAL FORMAT

Name ________________________________ Course Number APPS 499

Project Title _____________________________________

A. PROBLEM:

   Definition and limits of problem area.

B. PURPOSE and OBJECTIVES:

   Explanation of your interest in pursuing the project; why the area is of concern to you; and what you hope to learn.

C. PROCEDURE:

   Explanation of the methods you expect to use and any requirements for materials, equipment, or facilities.

D. OUTCOMES:

   Explanation of anticipated results of the project.

E. SCHEDULE:

   Proposed time schedule in weeks that includes all aspects required to complete the project.

Student signature ___________________________________ Date _____________

Faculty advisor signature _____________________________ Date _____________

FINAL REPORT FORMAT

One outcome of the senior capstone project is a technical report. This technical report will be retained by the department and used for future reference by both faculty and students so it must be professionally prepared, following standard technical report writing guidelines. The report will be graded on grammar, spelling, technical content, and technical writing format.

1. *Title Page*: A single sheet which lists the project title, name of student(s), faculty advisor's name, course and section number, date, and any other pertinent information.

2. *Letter of Transmittal*: A single page letter submitting the report for consideration by your faculty advisor that is signed and dated.

3. *Table of Contents*: (this will be the first page numbered – and the sequence will begin with ‘iii’) A single page identifying each section of the report as well as appendices.

4. *Abstract or Executive Summary*: No more than one page which summarizes the project including the problem, objective, procedure, and outcomes. The reader should be able to read this single page and understand the scope and results of the project.

5. *Equipment List*: This is a listing of laboratory equipment, instrumentation, engineering software, and/or manufacturing equipment that was used during the project. Included in the list should be the type of equipment, model number, and a short description. Photographs and/or drawings should be included where appropriate. Computers and software used for the report presentation should not be listed.

6. *Introduction*: (this page begins page 1) A complete description of the project that defines and explains the problem, purpose, objectives, assumptions, historical background, and general make-up of the report.

7. *Literature Search*: The results of the literature search and patent search should be presented. Any pertinent material should be placed in an appendix and referenced in this section. All references should be listed in the bibliography.

8. *Discussion*: This section presents a complete and thorough discussion of the project in terms of procedure used, engineering calculations, laboratory experimentation, design analysis, financial analysis, computer-aided engineering analysis, and any other pertinent information. A discussion and analysis of the results should also be included. Representative calculations should be included in this section with complete sets of data included in the appendices.

Figures, graphs, and photographs are appropriate and encouraged and must be identified with very detailed captions and referenced in the text. Engineering drawings should be included in the appendices and referenced in this section. The general idea when you present a Figure is that if it is ever separated from the text, any reader can tell exactly what they are viewing without any supporting text. It is also never a good idea to simply reference a Figure in parenthesis at the tail-end of a sentence (see Fig. 1). You should reference ALL Figures using painstaking wording, so that the reader can follow precisely one idea to the next and one graph to the next. Tables of data can also be included – and you should treat these just like Figures – with a highly detailed caption that goes along with the formal number. Figure numbers are always Arabic (1,2,3…), and Tables are always Roman numerals (I, II, III…). Captions for figures ALWAYS are placed under the picture (centered), while table captions are placed above the table (also centered).

9. *Conclusion*: Included in this section is a discussion of the results of your project. This section may include problems experienced during the project, recommendations for further work in the area, recommendations on how the project could be approached differently by future senior design students.

10. *Bibliography*: All references should be included using standard citation format.

11. *Appendices*: The section should be organized by material type and include all reference materials, computations, data, supporting materials, computer analysis results, and engineering drawings.

The report should be formatted as follows:

1. Section headings should be capitalized and underlined with 12-point font.
2. Body of the report should be single spaced 11-point font.
3. Top, right-hand, and bottom margins should be 1".
4. Left-hand margin should be 1½".
5. Each page should have the heading "Industrial Technology and Management" in 10-point font, right justified.
6. Each sheet (except the title page) should have a page number that is centered.
7. The report including appendices should be bound. Drawings larger than B size can be left unbound.
8. Table, figures, photographs, graphs, etc. must be identified with a caption.
9. References should be identified in the text with bracketed numbers. For example [1].
10. All engineering drawings should be prepared using 3-dimensional modeling.
11. Students are encouraged to submit their report, computer analysis, and drawing in digital format on a CD-ROM.

ORAL PRESENTATION

Each senior design project student is expected to make an oral presentation to department faculty and other students and potentially members of the advisory board. This oral presentation should be professional and utilize good technical presentation techniques. Audio-visual equipment will be available for student use by prior notification of the faculty advisor. The presentation will be limited to 20 minutes followed by a 10 minute question and answer session. The presentation should be structured to include all aspects of the project so that an individual with no prior knowledge of t he project can understand its entire scope as well as the results.

SECTION 3 ATTACHMENTS – Part 2

The following seven (7) pages are the Survey Instrument used as a supplement to the traditional Student Assessment of Instruction document (S.A.I.) for obtaining information that can be used for course improvements.

Student Assessment Evaluation (supplemental)

Course Number _______________ Semester _______________ Instructor _______________

Course Activities

1. HOW MUCH did each of the following aspects of the class HELP YOUR LEARNING?	no help	a little help	moderate help	much help	great help	not applicable
1.1 Attending lectures	☐	☐	☐	☐	☐	☐
1.2 Participating in discussions during class	☐	☐	☐	☐	☐	☐
1.3 Doing hands-on classroom activities	☐	☐	☐	☐	☐	☐
1.4 Please comment on how the CLASS ACTIVITIES helped your learning.						

Assignments, graded activities and tests

2. HOW MUCH did each of the following aspects of the class HELP YOUR LEARNING?	no help	a little help	moderate help	much help	great help	not applicable
2.1 Graded assignments (overall) in this class	☐	☐	☐	☐	☐	☐
2.2 The overall PACE of the course	☐	☐	☐	☐	☐	☐
2.3 Opportunities for in-class review	☐	☐	☐	☐	☐	☐
2.4 The number and spacing of tests	☐	☐	☐	☐	☐	☐
2.5 The fit between class content and tests	☐	☐	☐	☐	☐	☐
2.6 The mental stretch required by tests	☐	☐	☐	☐	☐	☐
2.7 The feedback on my work received after tests or assignments	☐	☐	☐	☐	☐	☐
2.8 Please comment on how the GRADED ACTIVITIES AND TESTS helped your learning.						

Course Resources

3. HOW MUCH did each of the following aspects of the class HELP YOUR LEARNING?	no help	a little help	moderate help	much help	great help	not applicable
3.1 The primary textbook	☐	☐	☐	☐	☐	☐
3.2 Other reading materials	☐	☐	☐	☐	☐	☐
3.3 Visual resources used in class (i.e. PowerPoint, slides, models, demonstrations)	☐	☐	☐	☐	☐	☐
3.4 Please comment on how the RESOURCES in this class helped your learning.						

Support for you as an individual learner

4. HOW MUCH did each of the following aspects of the class HELP YOUR LEARNING?	no help	a little help	moderate help	much help	great help	not applicable
4.1 Interacting with the instructor during class	☐	☐	☐	☐	☐	☐
4.2 Interacting with the instructor during office hours	☐	☐	☐	☐	☐	☐
4.3 Working with peers during class	☐	☐	☐	☐	☐	☐
4.4 Working with peers outside of class	☐	☐	☐	☐	☐	☐
4.5 Please comment on how the SUPPORT YOU RECEIVED FROM OTHERS helped your learning in this class.						

Your understanding of class content

5. As a result of your work in this class, what GAINS DID YOU MAKE in your UNDERSTANDING of each of the following?	no gains	a little gain	moderate gain	good gain	great gain	not applicable
5.1 The main concepts explored in this class	☐	☐	☐	☐	☐	☐
5.2 How ideas from this class relate to ideas encountered in classes outside of this subject area	☐	☐	☐	☐	☐	☐
5.3 Please comment on how THE WAY THIS CLASS WAS TAUGHT helps you REMEMBER key ideas.						

Increases in your skills

6. As a result of your work in this class, what GAINS DID YOU MAKE in the following SKILLS?	no gains	a little gain	moderate gain	good gain	great gain	not applicable
6.1 Finding articles relevant to a particular problem in professional journals or elsewhere	☐	☐	☐	☐	☐	☐
6.2 Critically reading articles about issues raised in class	☐	☐	☐	☐	☐	☐
6.3 Working effectively with others	☐	☐	☐	☐	☐	☐
6.4 Preparing and giving oral presentations	☐	☐	☐	☐	☐	☐
6.5 Please comment on what SKILLS you have gained as a result of this class.						

Course impact on your attitudes

7. As a result of your work in this class, what GAINS DID YOU MAKE in the following?	no gains	a little gain	moderate gain	good gain	great gain	not applicable
7.1 Enthusiasm for the subject	☐	☐	☐	☐	☐	☐
7.2 Interest in taking or planning to take additional classes in this subject	☐	☐	☐	☐	☐	☐
7.3 Confidence that you understand the material	☐	☐	☐	☐	☐	☐
7.4 Please comment on how this class has CHANGED YOUR ATTITUDES toward this subject.						

Instructor Specific Traits and Behaviors

8. In terms of the instructor, was the approach and quality of the items listed below of benefit to you in this course?	no help	a little help	moderate help	much help	great help	not applicable
8.1 The CLARITY of explanations provided by the instructor	☐	☐	☐	☐	☐	☐
8.2 The SKILL & EFFECTIVENESS of the instructor's verbal communication	☐	☐	☐	☐	☐	☐
8.3 The overall ORGANIZATION of the instructor in terms of the course, and in classroom activities	☐	☐	☐	☐	☐	☐
8.4 The instructor's ABILITY to explain and clarify difficult concepts	☐	☐	☐	☐	☐	☐
8.5 The EFFECTIVENESS of the instructor in addressing and answering student questions and concerns	☐	☐	☐	☐	☐	☐
8.6 The RELEVANCE of the examples the instructor used to REAL LIFE situations	☐	☐	☐	☐	☐	☐
8.7 The WILLINGNESS of the instructor to address the questions and concerns of students	☐	☐	☐	☐	☐	☐
8.8 The PACE of the instructor and his/her explanations in lectures and classroom discussions	☐	☐	☐	☐	☐	☐
8.9 Provide your PERCEPTIONS of the following items pertaining to the way in which the INSTRUCTOR approached the course and students	Definitely False	More false than True	In between	More true than false	Definitely true	Not Applicable
8.9.1 The instructor was WELL PREPARED for class each session	☐	☐	☐	☐	☐	☐
8.9.2 It is apparent that the instructor is KNOWLEDGEABLE in this subject area	☐	☐	☐	☐	☐	☐
8.9.3 The instructor treats me and other students in the class with RESPECT	☐	☐	☐	☐	☐	☐
8.9.4 The GRADES given by the instructor were assigned fairly and impartially	☐	☐	☐	☐	☐	☐

8.9.5 The instructor provided me FEEDBACK so I could improve my performance in the course						
8.9.6 The instructor RETURNED graded material quickly and efficiently after it was submitted						
8.9.7 The instructor used a variety of methods (not just exams) to ASSESS the performance of students in the course						
8.10 Gauge this instructor with respect to the following items	No chance	Slim chance	Slight chance	Strong chance	Very strong chance	Not applicable
8.10.1 The LIKELIHOOD you would want to take another course with this instructor						
8.10.2 The LIKELIHOOD you would RECOMMEND a friend to take a course with this instructor						
8.11 What specific traits concerning this instructor were especially helpful or outstanding, or which traits were not helpful or distracting? [Please Comment]						

If you would like to offer any further comments on items that were not addressed specifically, space is provided below. Thank you for your time and effort.

SECTION 3 ATTACHMENTS – Part 3

The following 29 pages are resumes and curriculum vitae of full-time faculty members, along with those adjunct faculty members that have been assigned to teach program courses within the past two years.

A N D R E W L . P U R V I S

2307 Pine Grove Dr.
New Era, MI 49446
(231) 861 – 5859
E-mail: purvisas@charter.net

Education

The University of Michigan Ann Arbor, MI

B.S. Materials & Metallurgical Engineering - 1985

M.S. Materials Science & Engineering - 1988

Ph.D. Materials Science & Engineering - 1991

- Dissertation: The Acoustic Emission Characteristics of Solidification and Formation of Casting Defects in Aluminum Alloy 319. Advisor: Robert D. Pehlke, Sc.D.
- Cognate Concentration: Mathematics and Numerical Methods

Academic Teaching Experience

2005 – Present Ferris State University – Grand Rapids Grand Rapids, MI

Program Coordinator/Advisor – Industrial Technology & Management

- Lead faculty member partnered with ten community colleges and Ferris State University to deliver this off-campus academic program, best described as a blend of business and engineering. Was responsible for developing and refining curriculum, preparing courses in a variety of subjects, interviewing, hiring and evaluating full-time and adjunct instructors, student recruitment, student advising and promotion of the program. Developed and directed an industrial advisory panel of outside stakeholders in the program, and oversaw all efforts for internal academic program review, assessment and external accreditation.

2001 – 2002 Western Michigan University Muskegon, MI

Assistant Professor and Department Head – Manufacturing Engineering

- Executed substantial leadership in launching and running a 2+2 partnership program with Muskegon Community College. In addition to full time teaching, advising and curriculum development, participated in scholarly research activities and extensive program promotion and marketing efforts.

1994 – 1997 Bradley University Peoria, IL

Assistant Professor – Department of Industrial & Manufacturing Engineering & Technology

- Faculty member for one of the premier undergraduate industrial and manufacturing academic programs in the world, teaching subjects in manufacturing engineering, materials science, basic engineering, microelectronics manufacturing, senior year industrial design projects and graduate level thesis projects. In addition, forged relationships with industrial partners for research projects and consulting agreements, developed extensive external research programs with government funding agencies and industrial partners, and served on numerous committees pertaining to student recruiting, laboratory policies, curriculum development and reform, ABET accreditation, rapid prototyping, industrial advisory committees and outreach programs for prospective students.

Industrial Experience

2002 – 2004 Corrosion Control Consultants, Inc. Beaver, PA/Muskegon, MI

Principal Engineer

- Equipment design, selection, installation and shake-down, process development and engineering, chemical and heat treating processing, tooling development and refinements, plant layout, process improvement, general troubleshooting and product qualification activities for materials science and metallurgy clients.

1998 - 2002 Howmet Research Corporation Whitehall, MI

Sr. Coatings Research & Development Engineer – Thermatech Coatings Satellite Laboratory

- Planned, executed and managed research and manufacturing production programs regarding processing, performance testing and production implementation via improved process and component performance, delivery, scheduling, product flow, waste elimination, production line automation, system synchronization and cost.

1991 – 1994 Howmet Corporation Whitehall, MI

Project Engineer – Operhall Research Center

- Formulated, conducted and managed operational, technical and strategic research on airfoil and vane component manufacturing for gas turbine engine applications. Investigated manufacturing processes of advanced single crystal, directionally solidified and equiaxed polycrystalline turbine components which reduced manufacturing costs through improved yield and product delivery.

Funded Research and Consulting Assignments

1994 - 1997 Howmet Corporation Whitehall, MI

- Investigated pattern recognition of solidification and advanced precision casting via computer modeling techniques for defect prediction and elimination.

1996 - 1997 Caterpillar, Inc. Peoria, IL

- As part of a joint Bradley University – Caterpillar practicum program, supervised three separate one-semester research projects, each involving one student researcher on proprietary research and science aspects of this major equipment manufacturer.

1996 Auto Owners Insurance Peoria, IL

- Expert witness on heat and fire damaged equipment related to insurance claims.
- Principal investigator for concept feasibility studies on welding equipment and processes.

2003 Turbine Overhaul Systems, PTE. Singapore

- Consulting assignment regarding equipment design, selection and installation, process development, and process engineering.

2003 – 2005 John W. Stanhope, PE PC Alpharetta, GA

- Consulting and contract engineering services for geotechnical applications.

Professional Memberships

Member, ASM International

Member, The Metals, Minerals and Materials Society of A.I.M.E. (TMS)

Member, Society of Manufacturing Engineers (SME)

University Service

- University of Michigan – faculty member for "Continuous Casting" continuing education course. 1988 – 1991.
- Bradley University – Department of Industrial & Manufacturing Engineering and Technology, Laboratory and Graduate Curriculum Committees. 1994-1997.
- Bradley University – College of Engineering & Technology, Outreach, Student Recruiting and Distance Learning Committees. 1994 – 1997.
- Bradley University – Manufacturing Summer Camp faculty member. 1996-1997.
- Bradley University – Faculty Sponsor for undergraduate (3) and graduate (2) student projects in the Student Research & Creative Achievement Exposition – 1995 – 1997.
- Bradley University – Spring Faculty Forum, presenter: "Using the West Point Model for Teaching Science & Engineering," January 1997.
- Ferris State University – Academic Senate. 2005 – Present.
- Ferris State University – University Curriculum Committee. 2005 – Present.
- Ferris State University – Organized and coordinated a team of students, faculty and staff for participation in annual "Physics Day" event at Michigan's Adventure Amusement Park, Muskegon, Michigan, May 2006.
- Ferris State University – College of Professional & Technological Studies – Curriculum Committee. 2006 – Present.
- Ferris State University – Presenter, Spring Faculty Learning Institute; "Into the Fire: Accountability for Students Using Real-World Projects in a Project Management course," April, 2009.

Honors and Awards

- U.S. Patent: "Solidification Control Including Pattern Recognition," (with C. Hanslits and R. Diehm) No. 5,841,669, November 1998.
- U.S. Patent: "Coating Gas Generator and Method," (with B. Warnes and D. Near) No. 6,793,966, September, 2004.
- U.S. Patent: "Chemical Vapor Deposition Method and Apparatus," (with B. Warnes and D. Near) No. 6,911,234, June, 2005.
- U.S. Patent: "Method of Forming Aluminide Diffusion Coatings," (with B. Warnes, I. McFarren and J. Cockerill) No. 7,273,635, September, 2007.
- Best Paper Award, American Foundrymen's Society, 1994, 1995.
- Bradley University College of Engineering Research Excellence Award, 1995, 1996.
- Selected for the N.S.F. Sponsored Program: Teaching Teachers to Teach Engineering, held at the United States Military Academy, West Point, NY, July-August 1996.
- E.I.T. State of Michigan Professional Engineering License Registration expected Fall, 2009.

Professional Service

- Session Chair – American Foundrymen's Society Casting Congress, Seattle, 1995
- Peer Reviewer – American Foundrymen's Society, seven papers, 1992 – 1998
- Process Modeling Committee member, American Foundrymen's Society, 1991 – 1997
- Peer Reviewer – American Society of Mechanical Engineers, ten papers, 1993 – 2008
- Peer Reviewer – American Vacuum Society, eleven papers, 1997 – 2007
- Session Chair - First International Conference on Sustainable Materials (ICoSM-2007), Penang Malaysia, June 2007
- Judge – FIRST Robotics, West Michigan Regional Competition, Grand Valley State University – 2006 – 2009

Community Service

- Media Spokesperson – "Homes for the Holidays," Restoration Society of Delavan, IL, 1996.
- Elected to the Ayer Public Library Board of Trustees, Delavan, IL, 1997 – 1998.
- Chairman, Properties Committee and Building Renovation Committee, Trinity Lutheran Church, New Era, Michigan – 2002-2005.
- Sought and procured assorted external funding grants from public and private foundations for New Era Christian School, New Era, Michigan, 2006-2007.
- Director and Adjunct Instructor – West Shore Community College Jazz Band – 2004 – 2006.
- Prepared nomination package for a local family for ABC Television Program "Extreme Home Makeover – Home Edition," 2004.
- Parent Field Trip Chaperone – New Era Christian School, numerous occasions, 2001 – 2009.

Skills & Expertise

- Extensive experience with applied mathematics in engineering problems, numerical simulation, pattern recognition, neural networks and signal processing.
- Six Sigma and Kaizen continuous improvement methodologies and practices along with designed experiments (DOE) and failure modes and effects analysis (FMEA).
- Experience in advanced statistics, design of experiments (DOE), failure modes and effects analysis (FMEA), quality requirements, single piece workflow and lean manufacturing.
- Finite element analysis, including heat transfer, computational fluid dynamics, electromagnetics and stress analysis.
- Advanced materials characterization, including electron microscopy, image analysis, mechanical testing and failure analysis.
- Effective, proven leader with exceptional communication, presentation and team building skills.
- Strong analytical and complex problem solving skills with exceptional focus, record keeping, budgeting and time management skills.
- Excellent rapport and relationships with previous students, using traditional lecture, active learning and internet classroom methodologies.
- Numerous technical publications, four U.S. Patents and two European patents pending.

Continuing Education Activities

- American Foundrymen's Society – Gating and Risering of Investment Castings – 1992
- American Supplier Institute – Taguchi Experimental Methodologies – 1992
- ASM International – Cryogenic Processing: Myths, Methods & Capabilities – 1998
- LGE Performance Systems – The Corporate Athlete – 1999
- Howmet Castings / GE Aircraft Engines – Six Sigma Training – 1999
- Howmet Castings – CPR Certification Training - 2001
- Howmet Castings – Supervisor Certification Program – 2002
- Ferris State University Faculty Center for Teaching and Learning – Rethinking College Teaching - 2005
- Ferris State University – WebCT Course Development Training – 2005-2006
- Ferris State University – Leadership Development Program – 2005-2006
- Ferris State University Faculty Center for Teaching and Learning – Creating a Learner Centered Classroom - 2007
- Ferris State University Faculty Center for Teaching and Learning – Assessment Strategies - 2007
- Ferris State University – FerrisConnect Block Training, 2007, 2009 – Level 4 Certification anticipated, summer 2009
- Ferris State University – Faculty Learning Community, "SAI Blues Workshop," 2009

Selected Publications

Refereed Publications

B.M. Warnes, A.L. Purvis and J.E. Schilbe, "The Manufacture and Fatigue Cracking Resistance of Grit-Free Aluminide Diffusion Coatings," Surface and Coatings Technology, 148-149, 2002, pp. 100-105.

A.L. Purvis and B.M. Warnes, "The Effects of Platinum Concentration on the Oxidation Resistance of Superalloys Coated with Single Phase Platinum Aluminide," Surface and Coatings Technology, 146-147, 2001, p. 1-6.

A.L. Purvis and B.M. Warnes, "A Study of the Diffusional Response of Refractory and Other Elements in Superalloy Systems During Diffusion Coating," Surface and Coatings Technology, 133-134, 2000, pp. 23-27.

A.L. Purvis, E. Kannatey-Asibu and R.D. Pehlke, "Linear Discriminant Function Analysis of Acoustic Emission Signals Generated During Solidification," AFS Transactions, 103, 1995, pp. 1-7. (Winner, Best Paper Award, Engineering Division, 1995)

A.L. Purvis C.R. Hanslits and R.S. Diehm, "The Importance of Thermal Parameters as Vector Components During Solidification Modeling of Single Crystal Investment Casting," AFS Transactions, 102, 1994, pp.637-644. (Winner, Best Paper Award, Investment Casting Division, 1994)

A.L. Purvis, E. Kannatey-Asibu and R.D. Pehlke, "Numerical Simulation of Solidification and Thermal Stresses During Solidification of a Restrained Bar Test Casting," AFS Transactions, 100, 1992, pp. 593-600.

A.L. Purvis, E. Kannatey-Asibu and R.D. Pehlke, "Evaluation of Acoustic Emission from Sand Cast Al Alloy 319 During Solidification and Formation of Casting Defects," AFS Transactions, 100, 1992, pp. 1-7.

A.L. Purvis, E. Kannatey-Asibu and R.D. Pehlke, "Acoustic Emission Signal Characteristics from Casting Defects Formed During Solidification of Al Alloy 319," AFS Transactions, 99, 1991, pp. 525-530.

M. Lukens, T.X.Hou, A.L. Purvis and R.D. Pehlke, "Mold/Metal Gap Formation of Al-14Si Alloy Horizontal Cylinders Cast in Chromite Molding Sand," AFS Transactions, 99, 1991, pp. 445-449.

A.L. Purvis and R.D. Pehlke, "Processing, Structure and Properties of Cast Al-Si Alloy 319 Using the Lost Foam, Evaporative Casting Process," AFS Transactions, 96, 1988, pp. 539-550.

Conference Presentations

A.L. Purvis, D.J. Green and S.A. Goffnett, "Bridging the Gaps in Industrial Ecology Education and Materials Manufacturing," First International Conference on Sustainable Materials (ICoSM-2007), Penang Malaysia, June 2007.

A.L. Purvis and B.M. Warnes, "The Effects of Entrapped Grit on the Thermomechanical Fatigue Properties of a Pt-Al Superalloy Coating," ASME Turbo Expo – 2001, paper number 2001-GT-0420.

A.L. Purvis and C.R. Hanslits, "The Application of Pattern Recognition During Solidification Modeling of Single Crystal Investment Castings," Modeling of Casting, Welding and Advanced Solidification Processes – VII, ed. J. Campbell and M. Cross, TMS Publications, Warrendale, PA, 1995, pp. 475-482.

A.L. Purvis, C.R. Hanslits and R.S. Diehm, "Computation of Thermal Gradient During Solidification Modeling of Single Crystal Investment Castings," EPD Congress 1994, ed. G. Warren, TMS Publications, Warrendale, PA, 1994, pp. 925-940.

A.L. Purvis, E. Kannatey-Asibu and R.D. Pehlke, "Modeling Thermal Stresses During Solidification," Modeling of Casting, Welding and Advanced Solidification Processes – VI, ed. Piwonka, et al., TMS Publications, Warrendale, PA, 1993, pp. 601-608.

Journal Articles

A.L. Purvis, C.R. Hanslits and R.S. Diehm, "Macroscopic Modeling Characteristics for Single Crystal Investment Castings," The Journal of the Minerals, Metals and Materials Society (JOM), January, 1994, pp. 38-41.

Invited Presentations

"Process Modeling in the Investment Casting Industry," Panel Discussion, AFS Casting Congress, Toronto, 1993.

"Macroscopic Modeling Characteristics for Single Crystal Investment Castings," Bradley University, Physics Department Symposium, October 1994.

"Numerical Simulation of Heat Transfer for Single Crystal Turbine Blades," American Foundrymen's Society, Central Illinois Chapter, Peoria, Illinois, March 1995.

"Corrosion Prevention Enhancement of Gas Turbine Components by Reactive Element Coating Additions," Solar Turbines, Inc., San Diego, California, April 2000.

"Deep Cryogenic Processing," Engineering Department, Lacks Industries, Kentwood, Michigan, September 2000.

"Cryogenic Treatment: An Overview for a Remarkable Process," West Michigan Chapter of ASQ, Muskegon, Michigan, February 2001.

Joseph J. Joyce
1239 Portsmouth Drive
Howell, MI. 48843
(517) 552-3333 (Work) / (810) 919-3857 (Cell)
E-Mail: jjoyce21@yahoo.com

Objective: To obtain a position as an instructor and advisor within a college of extended learning where I will be able to use my experience and education to help recruit, instruct, advise and assist various learners in their academic and professional goals.

Education: EASTERN MICHIGAN UNIVERSITY — Ypsilanti, Michigan
Sept. 04 to Present — Currently pursuing Ph.D. in Technology with a concentration in Engineering Management.

January 96 to August 99 — CENTRAL MICHIGAN UNIVERSITY — Livonia, Michigan
Graduated: August, 1999
Degree: Master in Business Administration, major in Management.

Sept. 89 to April 94 — OAKLAND UNIVERSITY — Rochester, Michigan
Graduated: April, 1994
Degree: Bachelor of Science in Mechanical Engineering, English Minor

Experience: *FERRIS STATE UNIVERSITY — Grand and Big Rapids, Michigan*
January 06 to Present — ***Instructor/SE Michigan Coordinator,*** *Ind. Technology & Mgmt. Program*
Responsible for the recruiting, teaching and advising of students within courses such as Operations Management, Issues in Manufacturing, Engineering Economics, Lean Manufacturing and Design for Manufacturing.

CONCORDIA UNIVERSITY — Ann Arbor, Michigan
January 07 to August 08 — **Adjunct Professor,** Business Department-Adult Degree Programs
Responsible for the teaching and advising of undergraduate and graduate students within courses within the School of Business such as: Organizational Behavior, Business Ethics, Strategic Human Resource Management, Advanced Management and Principles of Marketing.

SUFFOLK UNIVERSITY — Boston, Massachusetts
January 07 to August 08 — **Advisor/Internship Director,** Global MBA Program
Responsible for the direction of semi-annual internship projects as well as professional advising of graduate students within the GMBA program. Program provides industry experience for interns as well as opportunities for future employment upon graduation. Initiated University Relations program within Cri-Tech that will also provide internships (and potential employment opportunities) for technology/engineering students as well.

Experience (Con'd):

	CRI-TECH INC.	Howell, Michigan
February 06 to November 08	**National Sales Manager,** Elastomers Division Responsible for the marketing and sales functions within the organization. Supervision of corresponding personnel, budgets, forecasting and marketing responsibilities for Tier I/II automotive, aerospace and energy systems customers. Global customer account responsibilities within North American region, necessitating occasional travel to Europe.	
	GENERAL ELECTRIC COMPANY	Southfield, Michigan
January 03 to February 06	**Marketing Development Manager,** Advanced Materials Division Responsible for the marketing and sales functions in powertrain, suspension and NVH applications for Nissan, DCX and other OEMs as well as Tier I suppliers such as TRW Automotive, Delphi, Aisin, Visteon, SKF and Federal-Mogul within the Midwest States and Ontario, Canada regions. Received Six Sigma Green Belt training and certification also while at GE.	
	LAWRENCE TECHNOLOGICAL UNIVERSITY	Southfield, Michigan
January 00 to May 02	**Adjunct Professor of Business,** Business Department Responsible for the research, preparation, teaching, testing, advising and grading of students within courses such as Management and Supervision, Introduction to Management Information Systems (MIS), Introduction to Economics and Directed Study in Management.	
	ACUSHNET RUBBER COMPANY, INC.	Farmington Hills, Michigan
January 00 to January 03	**Territory Manager,** Automotive Division Responsible for the sales, engineering, quality and customer service functions in Powertrain applications for Ford, GM and Chrysler accounts. Also provided similar support for several Tier I suppliers such as TRW, Valeo and Delphi.	
	FEDERAL-MOGUL CORPORATION	Southfield, Michigan
November 96 January 00	**Applications Engineer**, Sealing Systems Division Responsible for engineering and sales functions through various applications for transplant accounts. Customers included Honda, Toyota, Mitsubishi, Mazda, Volkswagen and Nissan. Additional responsibility for General Motors and Chrysler accounts. Relocated from Summerton, SC manufacturing location where responsibility included production supervision.	

Special Skills/ Interests:
- Member of ESD-The Engineering Society, Society of Automotive Engineers, American Society of Mechanical Engineers and the American Society for Engineering Education.
- Working knowledge of German language via education and experience.
- Prior member of FME Federal Credit Union Board of Directors.

References: Personal references available upon request. July 2008

Sean P. Goffnett, CIT

Residence
1512 E. Gaylord St
Mt Pleasant, MI 48858
989.621.9986
s_goffnett@yahoo.com

PROFESSIONAL PROFILE

- Prepared to succeed as an industrial technology instructor at a leading university that will provide challenging opportunities to contribute to university goals and professional growth.
- Motivated professional with nearly a decade of industrial experience that ranges from manufacturing and assembly to product design and Six Sigma.
- Experienced in teaching undergraduate and graduate level industrial technology students.
- Demonstrated ability to seek external funding and conduct publishable research.
- Skilled in a wide-range of industrial tasks, particularly design and engineering, lean manufacturing, quality management and continuous improvement.

EDUCATION

Ph.D. in Technology – Concentration: Quality – Eastern Michigan University, Ypsilanti, MI
Expect May of 2007 [ABD summer 2006]

Master of Labor Relations and Human Resources – Michigan State University, East Lansing, MI
Received May of 2004

Master of Science in Engineering Management – Western Michigan University, Kalamazoo, MI
Received August of 2002

Bachelor of Science in Plastics Engineering Technology – Ferris State University, Big Rapids, MI
Received December of 1999

Bachelor of Science in Industrial Technology – Central Michigan University, Mt. Pleasant, MI
Received August of 1996

PROFESSIONAL EXPERIENCE

08/05 – Present **Adjunct Professor**
Eastern Michigan University, Ypsilanti, MI
School of Engineering & Technology

- Teaching on-line graduate courses in quality (measuring customer satisfaction & cost of quality)

05/05 – Present **Package Handler**
United Parcel Service (UPS), Mt Pleasant, MI

08/04 – 06/05 **Graduate Assistant & Project Coordinator for EMU's Center for Product R & D**
Eastern Michigan University, Ypsilanti, MI
School of Engineering & Technology; Center for Product Research & Development

- Taught undergraduate and graduate courses in industrial operations and quality, respectively
- Assisted area inventors and manufacturers with product design and prototype services
- Drafted grant proposal for the NSF Partnerships for Innovation Program
- Researched human aspects of manufacturing and quality management

05/04 – 08/04 **Operations & Human Resources Intern**
Regional Steel & Distribution Center (RSDC) of Michigan, Holt, MI

- Validated production reports for the manufacturing operations group and executive board
- Assembled Six Sigma Green Belt training materials
- Screened job applications and identified potential production associates

8/02 – 05/04 **Graduate Assistant & Program (Seminar) Specialist**
Michigan State University, East Lansing, MI
School of Labor & Industrial Relations; HR Education & Training Center; WC Center

- Co-Developed and delivered a 2-day program on Six Sigma methodology and implementation
- Created employment law update that included a presentation and workshop reference manual
- Researched corporate governance and issues in work related legal proceedings

7/01 – 8/02 **Six Sigma Black Belt**
Johnson Controls, Inc., Automotive Systems Group, Holland, MI

- Saved roughly $1,000,000 after leading four different teams through respective 6σ projects
- Coached and trained co-workers and participants in Six Sigma philosophy and methodology
- Managed project charters, timelines, team meetings, data analysis, and executive reports

2/00 – 7/01 **Project Engineer**
Johnson Controls, Inc., Automotive Systems Group, Holland, MI

- Co-Championed design development of interior door trim for Ford's '03 D/EW program
- Designed to NHTSA's Federal Motor Vehicle Safety Standards and to QS-9000 standards
- Tasked internal IDEAS and CATIA design engineers and several external engineering personnel

5/99- 2/00 **Resident Engineer**
Johnson Controls, Inc., Automotive Systems Group, Holland, MI

- Functioned as customer liaison to Ford Motor Co. on design and production of D/EW98 door
- Investigated and implemented viable design changes to improve end product
- Presented to various levels at OEM, from plant vehicle teams to vice presidents

8/98 – 5/99 **Graduate Assistant & Graduate Student Advisory Council Representative**
Central Michigan University, Mt. Pleasant, MI
Engineering & Technology Department

- Supported main lectures for general drafting and engineering design graphics courses
- Lectured special topics (e.g., AutoCAD), instructed lab sessions, and created instruction material
- Administered and graded homework, projects, quizzes, and exams

5/98 – 8/98 **Project Engineering Intern**
Johnson Controls, Inc., Automotive Systems Group, Holland, MI

- Supported design development and launch preparations for P90, GMX220, and WJ programs
- Assembled interior door trim for prototype launch of WJ program
- Measured process capability and suggested design and process modifications

3/94 – 5/98 **Product Engineer**
The Delfield Company, Mt. Pleasant, MI

- Designed custom stainless steel and fiberglass equipment to UL and NSF standards for customers in the medical and food service industries
- Provided design feasibility to sales team and customers (e.g., McDonalds and Applebee's)
- Worked with union liaisons to resolve any design and assembly issues during production

8/93 - 3/94 **Alternate Team Leader & Safety Representative**
CME Mitsuba Corporation, Mt. Pleasant, MI

- Assembled small automotive motors and electrical armatures for Honda and Ford Motor Co.
- Utilized statistical process control (SPC) and participated in continuous improvement (kaizen)
- Monitored line safety and reported weekly to management and members of safety committee
- Assisted team leader with scheduling, 5S, job design, team rotation, and JIT inventory control

PUBLICATIONS

Peer-Reviewed Work

Goffnett, S. (2004). Understanding six sigma: implications for industry and education. *Journal of Industrial Technology,* 20(4).

Book Chapter

Roehling, M. V. & Goffnett, S. (2003). The role of law in corporate governance. In W. Stopper (Ed.), *Restoring trust: HR's role in corporate governance.* New York: Human Resource Planning Society.

PRESENTATIONS & PROCEEDINGS

Oral Presentation: Sean P. Goffnett. Understanding six sigma and its bearing in industry and education. National Association of Industrial Technology 37th Annual Convention (Louisville, KY), October 2004

Professional Seminar: Sean P. Goffnett & Michelle S. Leiterman. Six sigma for human resources. Michigan State University Human Resources Education and Training Center (Livonia, MI), May 13-14, 2004.

PROFESSIONAL ASSOCIATIONS

National Association of Industrial Technology (NAIT)
American Society for Quality (ASQ)

CERTIFICATIONS & TRAINING

NAIT Certified Industrial Technologist (CIT)
MSU Certified Workers' Compensation Professional (CWCP)
Ford C3P (IDEAS v.VII) Part Modeling I & II
JCI Certified Six Sigma Black Belt
JCI Health, Safety, & Ethics Policies
Geometric Dimensioning & Tolerancing

COMPUTER SKILLS

CAD/CAM Software:
AutoCAD v. 10-14
SDRC I-DEAS v. IV, VI & VII
Moldflow v. 9.3

Environment/Systems:
Windows 95, 98, NT & XP
UNIX SUN-SPARC Stations
Ford's Worldwide Engineering Release System (WERS)
ANGEL Enterprise Course Management System
eLearning Systems
Blackboard Learning System

Application Software:
Microsoft Office Suites
Lotus Cc: Mail & Notes
Minitab, Statgraphics, & SPSS

Internet Software:
Netscape Navigator / Communicator
Microsoft Internet Explorer

CONDENSED LIST OF INDUSTRIAL EXPERIENCE & TOURS

Regional Steel & Distribution Center (RSDC) – Holt, MI
Johnson Controls, Inc. – Holland & Plymouth, MI
CME Mitsuba Corporation – Mt. Pleasant, MI
The Delfield Company – Mt. Pleasant, MI
Ford Wixom Assembly – Wixom, MI
GM Lansing Grand River Assembly – Lansing, MI
TRW Automotive – Fowlerville, MI
SSAB Hardtech – Mason, MI
Denso Manufacturing Michigan Inc. – Battle Creek, MI
Cascade Engineering – Grand Rapids, MI
Venture Industries – Grand Rapids, MI
Lacks Industries – Kentwood, MI
Plastech – Kentwood, MI
CS Tool & Die – Cedar Springs, MI
Morbark Industries, Inc. – Winn, MI
Northern Logistics – Clare, MI
EPW – Elkhart, IN
Ontario Die Company – Waterloo, Ontario, CA

Brian P. Bodemann
3828 Segwun Ave. SE
Lowell, Mi 49331
(616) 897-9965
E Mail: bodemannbrian@yahoo.com

Objective

Seeking employment as instructor in the Manufacturing Engineering

Summary of Qualifications

- 25 years of manufacturing experience.
- Graduate of the Manufacturing Engineering program at Ferris State University.
- Graduate of the Quality Technology Certification program at Ferris State University.
- Conducts quality and process training for the staff of Munn Manufacturing including "Lean Manufacturing", "Total Quality Management", Metrology, Continuous improvement and Statistical Process Control.
- CAD Design utilizing Catia V5.

Education:

- Ferris State University, Grand Rapids Michigan
  Certification in Quality Technology

- Ferris State University, Big Rapids & Grand Rapids Michigan
  Bachelor of Science Degree in Engineering - Manufacturing Technology
  Graduated With Honors

- Grand Valley State University, Allendale, Michigan
  Music Education Major

- Grand Rapids Community College, Grand Rapids, Michigan
  Associates in Music Degree

- Grand Rapids Community College, Grand Rapids Michigan
  Journeyman Card in Tool & Die Making (U.S. Dept. of Labor)

Professional Experience:

Munn Manufacturing Co.
Quality Manager: 03/2007 - Present

- Responsible for: Working with customers and suppliers in the assessment and resolution of quality issues.
- Quality and Process training for employees.
- PPAP Submissions.
- Process and quality planning of quoted products to be manufactured.
- Capability studies, scrap analysis, continuous improvement projects, trouble shooting and repair assessments of production equipment, processes, and tooling.
- Analyzing and compiling of quality and process history, trends, and solutions with reports to upper management.
- Work instructions, quality instructions, and updating control plans.
- Corrective actions and "8D" Problem solving.
- Capable of using Micro Soft; Word, Excel, Power point, Project etc.
- 5 S implementation.

Swoboda Inc. 06/2006 - 03/2007

Process Engineer:

- Responsible for: Team follow through of the design, building, gage R&R and correlation studies of production gages and fixtures.
- SPC charting and capability of the production processes. Trouble shoot manufacturing process including operator/team training, automated sub-components, machines, injection molds, trim dies, and equipment safety.
- Work cell improvements (OEE), "Lean" manufacturing implementation through the use of automated work cells and time studies. Incorporating ergonomics, line balancing and process routing within cells. Work instructions, quality instructions, and updating control plans. Layouts of incoming raw material and scrap analysis. Process mapping, continuous improvement implementation and 8D problem solving.
- Customer and vender relations in the resolution of quality issues and process improvements. Coordinate with outside suppliers on cost estimation, job quoting, and time line follow through of new equipment.
- Capable of using Micro Soft; Word, Excel, Power point, Project etc. and Capable of using AutoCAD LT and Catia V5 for CAD design.

Ferris State University, Big Rapids Michigan 05/2004 - 05/2006

Bachelor of Science Degree in Engineering - Manufacturing Technology

Student under the Michigan Works TRA program (GPA 3.75 on a scale of 4.0)

Robert Bosch Fuel Systems Corporation, Kentwood, MI 06/1994 -12/2003

(1400-employee manufacturer of diesel fuel injectors) (Plant closing)

Tool and Die Maker Journeyman:

- Responsible for: Product quality and working with engineering process teams to eliminate "bottle neck" operations and improving lean manufacturing flow.
- Implementation of processes for the servicing and maintenance of production machines. Design gages, prototype fixtures, production fixtures, and specialized parts for existing machines, as per engineering requirements. Prototype work on new products, components, fixtures and gages.
- Cost estimation, job quoting, process flow of large orders and special components through the tool room, for pump unit production line as well as shift follow ups.
- Preventive Maintenance and Repair existing machine components.
- Working knowledge of metric and English measurements and prints. Capable of building, working with and holding close tolerances, microns or tenths.
- Setup and program CNC machines, operated standard tool room equipment, such as lathes, horizontal and vertical mills, precision grinders, radial arm and standard drill presses jig bore machines, and hand tools.

Tool and Gage Inspection:

- Check, qualify and calibrate new gages for production, tooling, existing production gages, fixtures and component layouts and chart characteristics.
- Service and calibrate various measurement instruments such as optical comparators, air gages profolometers, and dial indicators.
- Programmed and operated round and surface test, contour tracing, and flatness test equipment.

Master Die & Engineering, Wyoming, MI 1985-1992

Tool and Die Maker Journeyman:

- Built, repaired and assisted in design of progressive dies, form dies, Pierce dies, blanking dies, trim dies, and prototype dies. Built and partially designed gages, special machines, and specialized parts or components, assembly and welding fixtures, and part test fixtures. (I.e. vibration test fixtures.) Worked with pneumatic logic and hydraulics.
- Performed die repairs, as well as machine setup and repair.

Amerikam Inc., Wyoming, MI 1980-1985

Tool Maker Apprentice:

- Completed apprenticeship and received journeyman certification.
- Built special and prototype production machines, parts and fixtures for screw machines and stamping dies. Performed set up and repair of production machines.
- Utilized air gauging and optical comparators, set up and operated CNC mills and lathes.

Educational Studies:

Ferris State University, Big Rapids & Grand Rapids Michigan 05/2004 - 05/2006

Bachelor of Science Degree in Engineering - Manufacturing Technology

Quality Engineering:

- Quality Science Statistics, Statistical Process Engineering and control methods (SPC, Statistical Capability), Design of Experiments (ability to use "Stat Ease" software for Yates analysis). Metrology (Geometric Tolerancing, Gauging, and Gage R&R, etc.)

Industrial Engineering:

- Lean Manufacturing Methodology, Lean Applications pertaining to product production flow, work cells, assemblies, and non production departments. Cost estimation and time studies.

Manufacturing Processes:

- Manufacturing Production Processes (machining, casting, forging, ECM processes etc.)
- Process Planning, Process Design Analysis (production and assembly procedure analysis) Production Welding Processes (production spot, arc, and wire feed welding systems etc.), Plastic Processes (injection molding, blow molding etc.)
- Automation Systems Design (automated assembly lines) including Design For Manufacturability & Assembly (DFMA) Manufacturing Facilities Planning incorporating Lean Mfg. Planning and process simulation (ability to use "Flexsim" software for "lean" facilities & modeling) and work cell layout. Engineering Economics and Managerial/Supervisor skills courses.

Computer Applications:

- Computer Applications for Engineering (Micro Soft word, Excel, Power point, Project etc.)
- Model & Prototype Development, CAD Design (Catia V5 and Pro – Engineer Wildfire II software modeling, assembly & detailing) Tool Engineering, CNC and CAM.

Mechanical Engineering:

- Statics and Strength of Materials and Material Sciences, Physics, Plus Core Curriculum.

Quality Certification: 01/2007 - 05/2007

Ferris State University, Grand Rapids Michigan

- Continuous Improvement MFGE 443

Kenneth R. Clark
4628 Sandy Lane
Whitehall, Michigan 49461
Telephone: (231) 894-8718

Position Objective:
Eventually, I would like to teach and train, full time. Ideally, at the college level.

Business Experience:
Howmet Corporation – Whitehall, Michigan *April, 1987 to Present*
Manager Continuous Improvement, responsible for Training, Education and Development, Kaizen, Employee Involvement and Total Quality Management (TQM). Focus is Work Cell Optimization, capturing Best Practices, implementing the Toyota Production System (TPS) facilitating a climate of Customer Focus and Continuous Improvement.

Ferris State University (FSU) – Big Rapids, Michigan *August, 2004 to present*
As an adjunct instructor for Ferris State University, I taught:
Fall, 2004 APPS 490 Manufacturing Improvement Management
Spring, 2005 MGMT 351 WMA Contemporary Issues in Industrial Management
Fall, 2005 APPS 351 WMA Lean Thinking for Production Flow and Plant Layout
Spring, 2007 MGMT 351 WMA Contemporary Issues in Industrial Management
Fall, 2007 APPS 351 WMA Lean Thinking for Production Flow and Plant Layout
Spring, 2008 APPS 490 Manufacturing Improvement Management
Fall, 2008 Manufacturing Certification and Standardization

Meijer, Inc. – Lansing Michigan *February, 1984 to April, 1987*
Distribution Unit Director, managed a 500,000 square foot General Merchandise Distribution Center containing 12,000 items valued at 25 million dollars with 100 million plus in annual sales. I was responsible for 2 managers, 5 supervisors, 18 administrative personnel, and over 100 hourly associates, members of United Food and Commercial Workers – Local 951. From 2/84 to 10/84, I was Customer Service Manager for Meijer Distribution in Grand Rapids, Michigan. I supervised a department of 10 expediters responsible to collect data on Distribution Performance and develop proactive solutions to trend data.

Brunswick Corporation – Muskegon, Michigan *January, 1982 to February, 1984*
Quality Assurance Engineer/Employee Involvement Coordinator. I was responsible for initiating an Employee Involvement program that grew to 12 teams. I also was Quality Assurance Engineer for the Pinsetter Plant and Supervisor for 3 inspectors. I developed and taught Employee Involvement Leader and Member training. I also developed and taught Statistical Process Control (SPC) to all the managers, supervisors, and engineers.

Business Experience: Continued

General Motors Corporation – Grand Rapids, Michigan *April, 1979 to January, 1982*

After graduating from college, I joined General Motors' Diesel Equipment Division as an Hourly Inspector. I soon became an Inspection Auditor and then Reliability Engineer. Less than one year after joining G.M., I was promoted to Inspection Supervisor, responsible for over 30 Quality Assurance Inspectors. During this time, I also taught full time one semester for South Kent Community Education.

Formal Education:

Master of Science in Administration (MSA) Central Michigan University (CMU) – Mount Pleasant, Michigan (May, 1987).

Michigan Secondary Provisional Certificate. Certified to teach Communications, English, Speech and Theater at the secondary level – State of Michigan (April, 1979).

Bachelor of Science (BS) – Western Michigan University (WMU) – Kalamazoo, Michigan (April, 1979).

Affiliations:

American Society for Training and Development (ASTD), Association for Quality and Participation (AQP), American Society for Quality (ASQ), White Lake Area Chamber of Commerce, Tax Increment Finance Authority (TIFA) and Local Development Finance Authority (LDFA) and White Lake Community Foundation.

Sports:

Fishing, Hunting, Golf, Bowling, Tennis and all other active sports.

References and Salary History – available upon request.

SALEH M. KARSOU,
400 Kellogg st. # 6, Ann Arbor, MI. 48105 salehkarsou@yahoo.com, Tel: 734-913-6953

Professional Certifications

Certified Reliability Engineer with American Society for Quality (2003)
Certified 6-Sigma Black Belt with American Society for Quality (2004)
Certified Quality Manager expected Oct. 2006.

Education

Bachelor of Science in Mechanical Engineering May, 1994.
Kansas State University, Manhattan, KS.
Masters of Business Administration,
Expected Graduation Date: TBD, Davenport University, Dearborn, MI.
Ford Technical Education Program – Ford Motor Company Certifications

Professional Experience

Reliability Engineer , **Jan. 2001 –Present**
Contract Assignment at Ford Motor Company, Dearborn, Michigan
- Coach and train suppliers and Ford engineers to adapt and meet Ford's new quality & Reliability targets.
- Co-authored training material to assist suppliers and Ford engineer to use as a quick reference.
- Represent reliability dept. / electrical engineering at the Ford's Technical Club.
- Support program technical design reviews (TDRs) with Ford Core Engineering.
- Lead teams towards a detailed and methodical review of the deliverables and their completion time with the supplier and their managements expressing Ford Motor Company 's expectations.
- Understand and help to accelerate electrical engineering competence through success replication and modification of DVP&R as needed.
- Lead Green Belt Projects for plant waste/scrap reduction and reduction of dealers warranty. Provide detailed analysis using advanced techniques, and benchmarking.
- Track and develop quality roadmaps by interfacing with quality and marketing function. KANO Model
- Track engineering programs time line/ milestone progress and report progress to senior management.
- Track High Mileage program issues, timeline deliverables ensuring info. is communicated involved members.
- Benchmark competitor vehicles and analysis assessments on customer satisfaction.
- Provide reliability analysis, projections and recommendation for future models using early quality indicators.
- Lead ISO preparations and represent dept. during ISO Audits.

Product: Navigation System, Satellite Radio, Bluetooth, THX3 application, Airbags Modules.

Product Quality Engineer, **Feb. 1998 to May 1999 - July 1999 to Dec. 2000**
Wabash Technologies Inc., Huntington, Indiana & Federal Mogul Corp. Van Wert, Ohio.
- Led Cost of Quality Teams to reduce manufacturing waste and provided report to senior management.
- Used 8D & Honda's 5P to address and resolve quality issues.
- Participated in company's effort to maintain QS-ISO certification.
- Performed internal company audits & suppliers/sister companies' external QS-9000 audits.
- Worked with suppliers and receiving inspection to reduce PPM. & develop vendor certification.
- Wrote and updated FMEAs and Control Plans as part of a team effort.
- Participated in engineering design reviews applying lessons learned towards future models.
- Lead the qualifying of new equipment – PPAPs, Participated in development and qualification of U-shaped production cells including retraining production personnel.

- Implemented new CMM software programs & equipments for entire FM company for Y2K preparation.
- Published a quality monthly newsletter to educate peers about quality concepts and tools.

Customers: GM, Honda, and Toyota. Product: Automotive Motion Sensors, Automotive/RR Seals.

Automotive Quality Engineer (APQP), May 1997 to Feb. 1998
Osram Sylvania Products Inc. Auto Lighting Division, Seymour, Indiana

- Responded to customer's quality issues by visiting plant sites during Pre-launch and production.
- Worked closely with suppliers to insure quality of in-coming product.
- Tested and reported product quality during prototype, preproduction and production stages.
- Updated control plans, PFMEA & DVP&R.
- Responsible for PSO & PPAP documentation per QS9000 requirements.
- Responsible for development and qualification of production fixtures and tools thru G R&R.
- Reviewed and approved gage design (GR&R) and specified critical dimensions.

Customers: GM, Chrysler, and Ford, Product: Exterior Lighting.

Automotive Quality Engineer, Aug.1995 to Oct. 1996
EXT, Inc. Lenexa, Kansas

- Lead the development of a formal quality system through ISO9000 certification process/audits.
- Designed a formal quality system from the ground up, Implemented SPC, Gage R&R, traceability requirements
- Interfaced with customers as main quality representative.

Customer: GM, Honda, Product: Injection Molding, Thermoforming & Assembly.

Software / Tools Knowledge

Hertzler Statistical Package, SQC-Pack3.0, Access, Excel, Power Point, Word, Artificial Intelligence, Lotus1-2-3. Ford Specific:Info.link, AWS, Warranty Cube, CQIS, eFPDS, Minitab.

STEVE A. LANDENBERGER
13332 Lakeshore Drive
Grand Haven, MI 49417
(616) 850-2149

Objective: To obtain a part time teaching position from a higher education institution in the field of Industrial Technology and/or Quality. This position will allow personal growth in my existing field of Quality Management and Industrial Technology where I have participating in the last 20 years.

Summary: Competent and productive Quality Assurance Manager, Plant Manager, College Instructor, Quality System Consultant, and an effective engineer with a B.S. and M.E. in Industrial Engineering. Work experience includes ten years as a Manager/Engineer with a Fortune 500 company, fifteen years experience as a Quality Assurance Manager for four different companies supplying the automotive, office furniture, exercise equipment, and floor cleaning equipment companies. Experience includes over one year as an Operations Development Manager emphasizing Total Quality for the food industries, and over one-year as a Plant Manager for a major automotive supplier. Areas of knowledge and experience include:

- Plant Management
- Total Quality
- Statistical Process Control
- Project Management
- Production Supervision
- Engineering Support
- College Instruction
- Consultant Services

Work Experience

10/96 - Present:	Quality Assurance Manager Nelson Steel Products, Holland, MI
12/95 – 09/96:	Senior Consultant in Quality System Development and Engineering Services Quality Resource Group, Grand Rapids, MI
2/95 11/95	Quality Assurance Manager Uniform Color Company, Holland, MI
02/94 – 02/95	Plant Manager Shape Corporation, Grand Haven, MI
05/88 – 02/94	Quality Assurance Manager Nelson Steel Products, Holland, MI
09/89 – Present	College Instructor - SPC/Quality Improvement and Industrial Technology Baker College of Muskegon Michigan
08/88 – 05/00	College Instructor - Engineering and Industrial Technology Grand Valley State University, Allendale and Grand Rapids, MI
12/86 – 05/88	Operations Development Manager Pillsbury/Green Giant Corporation, Belvidere, IL
11/84 - 11/86	Quality Assurance Manager Automatic Spring Products Company, Grand Haven, MI
02/74 – 11/84	Industrial Engineer, Production Supervisor, Quality Engineer John Deere Waterloo Works, Waterloo, IA

Plant Management

Leading a plant with over 250,000 square feet and over 100 employees over 3 shifts

Leading the effort towards Self-Managing Work Teams

Member of Staff Committee to change overall corporate systems

Acted in capacity of Quality Assurance Manager for 5 months in addition to Plant Manager duties

Total Quality

Developed and implemented a Total Quality System for Pillsbury/Green Giant at Belvidere, Illinois. It became the foundation on how the plant operated. It also became the framework for other Pillsbury/Green Giant plants.

Developed and implemented a Total Quality System for Automatic Spring Products of Grand Haven, Michigan. This system satisfied the quality requirements for Ford and Gm as a qualified automotive supplier.

Developed and implemented a Total Quality System for Nelson Steel Products of Holland, Michigan. This system satisfied the requirements for ISO9000.

Statistical Process Control

Provided statistical expertise in several areas of business units, including manufacturing, distribution, human resources, and accounting.

Performed several capability studies in various manufacturing environments.

Developed and instructed several courses on SPC for various companies in the Midwest United States

Project Management

Coordinated the Supplier Certification Program for John Deere Waterloo Operations. Project saved the company $7 million.

Initiated the redevelopment of three transmission lines for tractors. Investments included several new material handling systems totaled over $2 million.

Led a project to reduce downtime and waste on frozen food packaging line. Used the tools of SPC to reduce downtime by 50%.

Engineering Support

Relocated two machining departments consisting of over 100 machines and handling equipment.

Assisted in the complete facility layout of a tractor assembly line and building.

Assisted in several problem-solving projects that eliminated scrap and rework of product.

College Instruction

Currently teaching night classes at Baker College, Muskegon MI in the field of SPC and Industrial Technology. Courses include the following

1. Statistical Process Control and Design of Experiments
2. Facility Design and Work Design and Measurement
3. Project Management
4. Lean Manufacturing
5. Engineering Economics
6. Manufacturing Processes
7. Geometric Dimensioning and Tolerancing
8. Fundamentals of Production Measurement and Blueprint Reading

Taught night classes for Grand Valley State University in the field of Engineering Statistics.

Taught Industrial Technology courses for Grand Valley State University.

Consultant Services

Provided QS9000 and ISO9000 implementation assistance and engineering services for several West Michigan businesses.

Provided SPC training and consulting services for several West Michigan businesses.

Worked with Grand Rapids Community College as an SPC trainer and consultant.

Worked with Muskegon Community College as an SPC trainer and consultant.

Education

B.S.I.E. University of Nebraska	December, 1976
M.E.I.E. Iowa State University	December, 1984
Certified Quality Engineer (CQE)	June, 1985
Certified Quality Auditor (CQA)	December, 1993
Certified Quality Manager (CQMgr)	March, 1996

Affiliations

American Society for Quality (ASQ) Chairman of the Holland Section (1993 - 1995)

John F. Mola
460 W. Lewiston Ave.
Ferndale, Michigan 48220

(248) 544-7918 johnfmola@yahoo.com

CAREER AND EXPERIENCE HIGHLIGHTS

- Recent MBA graduate
- Automotive Design, Engineering & Process expert
- Publication and patent holder
- Ten years experience managing direct report personnel
- Skilled initial project negotiator
- Solid strategic leadership improvement history
- Strong technical and mechanical aptitude
- Cold project startup expert
- Vast international experience
- Thorough and aggressive problem solver
- Strong cost and time management skills
- Effective leadership abilities emphasizing factual data and teamwork
- Commercial and sales experience with solid technical foundation
- Trained on SAP 4.6 application
- Six Sigma Greenbelt training in process

WORK EXPERIENCE SUMMARY

NOV 05 – PRESENT

COLLINS & AIKMAN – **Senior Engineering Manager** (Troy, MI)

- Responsible for the development of the 2007 Chrysler HG console and instrument panel programs.
- Lead 7 direct report engineers and 2 direct report engineering managers.
- Responsible for all issues regarding engineering, design, validation testing, cost, quality, and manufacturing for the 2007 Chrysler HG console and IP programs.
- Primary customer-interface and launch readiness coordinator.
- Primary engineering recruiter and trainer of engineering disciplines.

MAR 05 – NOV 05

GENERAL ELECTRIC – GE Advanced Materials – ***Account Development Manager***

- Strategic account planning and marketing development for a defined sales territory
- Primary customer contact for new product development and pricing negotiations
- Responsible for meeting company growth targets by developing sales to new customers, expanding current customer usage, and margin improvement.
- Automotive industry content expert in charge of driving GE products into the industry specification.
- Technical liaison between manufacturing, quality, service, marketing and research areas within the company.

JAN 95 – MAR 05

LEAR/GM DIVISION – ***Engineering / Program Manager*** (Troy, MI)

- Responsible for all (approx. 28) car and truck current production interior trim programs and 8 direct report engineers
- Implemented Product Data Management (PDM) structure within truck portion of Lear – GM
- Led total programs including manufacturing, advanced quality, sales, purchasing, and supplier base toward issue resolution using disciplined engineering approach
- Accountable for budgets, expenditures, staffing, and priority establishment of all current production interior trim programs
- Initiator and manager for all VAVE cost reduction proposals including feasibility analysis, ranking, and probability ranking.

LEAR / GM DIVISION – ***Engineering Manager*** (Madison Heights, MI)

- Managed team of 5 engineers during 2003 GMT610 interior trim launch including troubleshooting quality / design / manufacturing issues and solution implementation

- Coordinated all communication with suppliers, quality, internal departments and manufacturing plants during design, prototype, and production phases
- Accountable for budgets and expenditures of 610 engineering department
- Led cost reduction efforts

LEAR / TRANSNATIONAL DIVISION - ***Engineering Manager*** (Dearborn, MI)

- Resided in Japan to design and develop the 2003 Nissan Maxima interior trim
- Primary customer interface and relationship role
- Led a Lear team of 6 engineers and 12 CAD designers onsite at Nissan
- Managed design, budgets, manpower, suppliers, testing, and cost recovery

LEAR DONNELLY DIVISION – ***Senior Development Engineer*** (Southfield, MI)

- Explored new and unique technologies for future application in automotive overhead systems with focus on air curtain integration, audio system development, and headliner substrate development
- Managed timing, cost and development activities for these advanced products
- Supported all Lear divisions in showcasing our new technology to customers
- Founded the Lear "OASys" headliner audio system

LEAR / AUTOMOTIVE INDUSTRIES - ***Senior Product Engineer*** (Dearborn, MI)

- Resided in London to design and develop the 1998.5 Mercury Cougar interior trim with Ford of Europe
- Directed our US based design team from Ford of Europe
- Managed suppliers, budgets, tool shops, resources, and two US based product engineers

DEC 93 – JAN 95

TEXTRON AUTOMOTIVE – ***Lead Design Engineer*** (Troy, MI)

- Responsible for the design of the 1998 Chrysler LH platform instrument panel
- Provided design direction and coordination between Chrysler studio, engineering, our CAD designers, suppliers and the remainder of the LH team
- Implemented program engineering disciplines (DFMEA's, DVP&R's and Bill of Materials)
- Led finite element analysis team to design knee impact system, lighter and less expensive than previous LH design while improving energy absorption

NOV 92 – DEC 93

AEROQUIP CORPORATION – ***Project Engineer*** (Mt. Clemens, MI)

- Worked with Ford on the design and manufacture of automotive interior trim components
- Core design products included instrument panels, air conditioning outlets, and glove box assemblies
- Managed programs from concept to production including all interfaces with manufacturing, tools shops and our customer
- Coordinated all quality, part design, tool design, budget and initial part submission activities

DEC 89 – NOV 92

NIPPON SEIKI INTERNATIONAL – ***Application Engineer*** (Southfield, MI)

- Acted as a technical liaison between our engineers in Japan and American customers to design instrument clusters that met specific vehicle applications
- Managed design, packaging, and initial part submission to our customer
- Traveled to parent company in Japan as required for training and support

EDUCATIONAL SUMMARY

UNIVERSITY OF MICHIGAN (Flint, MI)

- Graduated with distinction from the University of Michigan with a Masters of Business Administration degree.

UNIVERSITY OF MICHIGAN (Flint, MI)

- Graduated from the University of Michigan with a Bachelor of Science degree in Engineering Science.

PROFESSIONAL AFFILIATIONS

- Engineering Society of Detroit
- National Firebird Club

- SRT Owners Club

PATENTS AND PUBLICATIONS

- Patent Issued: *"Vehicle Overhead Console With Flip Down Navigation Unit"*
  Status: Issued September 26, 2000 Patent No. 6,125,030
- Patent Pending: *"Integrated Headliner Audio System"*
  Status: Pending as of 3/26/02
- Publication: Modular Manufacturing: "Evolution of the Overhead System"
  J. F. Mola, Presentation and Publication – A&TI
  Automotive & Transport Interiors, Cobo Hall, Detroit Michigan 1999

COMPUTER SKILLS

- Proficient in most common office computer programs including MS Office, Excel, Word, Powerpoint, and Project.
- Extensive personal and professional internet experience including buying/selling and research.
- Literate on most automotive OEM CAD systems including Unigraphics, and Catia.
- Led implementation of Lear's internal Project Data Management (PDM) database software within the GM Division.
- Proficient on SAP 3.1 and 4.6 ERP.

DAVID W. PIGGOTT, CMfgT, AAI

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Professional Experience . . .

October 2005 to present – CrWare, LLP Copper Canyon, Texas.

From October 2005 through July 2006 I developed course content for the Autodesk AOTC courseware on contract for CrWare. The content included material for AutoCAD 2007 and Inventor 11. Beginning in December 2006, I have been developing AOTC content for the AutoCAD 2008 release. In addition, I am a regular instructor at AUGI CAD Camps around the country and at Autodesk University presenting classes on both Inventor and AutoCAD functionality.

June 2003 to present – Owner, Quantum Training Centers - GR Grand Rapids, Michigan.

From 2003-2006, Quantum Training Centers performed as a satellite Autodesk Authorized Training Center. Beginning in March 2006, all Quantum services have been delivered at customer sites. I provide software implementation as well as both "generic" and "custom" classes/consulting to business, industry, and education institutions. I instruct all levels of AutoCAD and Inventor software. Daily tasks include analyzing customer requirements and business needs to propose training and software solution sales, marketing, course development, troubleshooting for clients, product design, and customer visits, and teaching.

August 1989 to June 2004 – **Instructor**, Grand Rapids Community College, Grand Rapids, Michigan.

Responsibilities included managing and teaching in the Autodesk Authorized Training Center and all CAD/CAM training and consulting activities delivered through the Business & Technical Training department of the Grand Rapids Community College. I was also instrumental in developing and delivering new courses in Metal Forming including Press Brake Operation, Laser Cutting Operation and Stamping Press set up. Daily activities included scheduling of training activities, rooms, instructors, and teaching AutoCAD and Metal Forming classes, and developing custom learning opportunities for clients.

June 1986 to August 1989 - **CAD/CAM Systems Administrator**, Autodie Corporation, Grand Rapids, Michigan.

My responsibilities were to maintain and improve the performance of Autodie's CAD/CAM systems through methods improvement and the development of customized software. In addition, I detailed die designs, generated CNC programs, and maintained the computer hardware.

May 1981 to June 1986 - **Assistant Systems Manager/Programmer/Designer/Mold Maker**, Autodie Corporation, Grand Rapids, Michigan.

My responsibilities included design, process, and creation of tool paths for CNC lathes and mills. I completed a Mold Making Apprenticeship including all aspects of building Compression and RIM tooling for the automotive industry.

Achievements ...

- Own and operate successful training and consulting business.
- Provided leadership resulting in recognition by Autodesk of the Autodesk Authorized Training Center at Grand Rapids Community College. GRCC was recognized for Outstanding Performance, Instructional Quality, and Facilities & Staff for the years 1999 and 2000.
- Developed courses and trained company personnel in Laser Cutting and Press Brake Operation and Metal Forming Basics.
- Participated with Oakland Community College and Prince Corporation to develop and deliver Automotive Body design training in west Michigan.
- Developed an 18-week, 40 hour/week CAD/CAM course for re-training of unemployed workers.

Educational Highlights ...

Ferris State University, Big Rapids, Michigan	
M.A. Educational Leadership Program,	20 Hours Completed
Autodesk Certified Inventor Expert	2004
SME Manufacturing Engineering Certification Institute, Dearborn, Michigan	
Certified Manufacturing Technologist,	1994
Ferris State University, Big Rapids, Michigan	
B.S. Manufacturing Engineering Technology,	1992
A.A.S. Machine Tool Technology,	1981
Autodie Corporation, Grand Rapids, Michigan	
Journeyman Mold Maker,	1984

Memberships ...

Autodesk Training Center Advisory Board member (ATCAB)	2005 - Current
Autodesk Training Center Executive Committee member (ATCEC)	2000 - 2002
ATCEC Chair of Sub-committee on Courseware Content	2000 - 2002
GRCC Meet & Confer Employee Handbook Development Team	2000 - 2001
GRCC Strategy Team Member	1999 - 2000
Comstock Park Public School Safety Handbook Committee	1998 - 2000
Distance Learning Co-Chair (GRCC)	1994 - 1996
Calma National Users Group	1986 - 1989

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PROFILE

Results-oriented operations and business development leader with extensive experience as both a supplier and a OEM customer within the automotive industry. Strong track record reducing costs and increasing productivity through exemplary strategic planning, vendor development, and effective change management. Expertise includes lean manufacturing, plastic injection tooling, molding processes, product design and fabrication, contract negotiations, and project leadership. Dedicated to building and developing high performing teams that exceed expectations.

EXPERIENCE

GENERAL MOTORS CORPORATION, Warren, MI — **1999 – Present**

The largest manufacturing organization in the world, with manufacturing and engineering facilities on every continent.

Held various engineering positions, with overall responsibility for program execution, developing technical & manufacturing specifications, and performance/quality assurance. Aligned objectives of product development, manufacturing capability, and quality, while maintaining project budgets and deadlines. Conducted investment & equipment analysis, to ensure that suppliers' bids aligned with corporate targets.

Program Lead Engineer & Exterior Trim SME (April 2005 – Present)

- Developed standardized work processes for the Global Paint & Polymer Center (GPPC)
- Served as liaison between GPPC and GM assembly plants, in order to identify build issues during vehicle launches and accordingly provide direction to the engineering execution team
- Managed program timing, with responsibility for facilitating and leading supplier readiness meetings

Engineer Supervisor (Dec. 2004 – April 2005)

- Responsible for ensuring supplier qualification
- Conducted performance feedback reviews for a team of six engineers

Senior Manufacturing Project Engineer (2002 – Nov. 2005)

- Managed manufacturing projects relating to the Vehicle Development Process
- Directed manufacturing and design activities of multinational Tier I team
- Conducted investment and piece price negotiations with suppliers

Senior Advanced Manufacturing Engineer (1999 – 2002)

- Guided manufacturing engineering team in execution of GMX375 GMX357 Program
- Managed source selection, cost evaluation, risk assessment analysis, FMEA, trouble shooting, PPAP, APQP, and other vehicle launch activities as a member of a cross-functional team

THE BARTECH GROUP, Troy, MI — **1998 – 1999**

A national staffing firm

Manufacturing Engineer (1998 – 1999)

Recruited to provide expertise in interior trim plastic injection mold design and manufacturing to the tooling division of GM/Saturn

- Instrumental in developing tooling specific SOR, with specific responsibility for developing Operator Instruction Sheets, Process Flow Diagrams, and Process Control Plans
- Devised GD&T schemes and gage design
- Collaborated with team in developing Saturn Vehicle Interior Systems (VIS) mold standards
- Recognized as subject matter expert throughout the Saturn tooling source selection process

RATECH, INC., Novi, MI 1994 – 1998

Plastic injection mold suppliers to Tier I and Tier II automotive customers. Produced wheel covers, hub caps, electrical components, and handle molds for automotive industry

President

Held full P&L responsibility, for plastic injection tooling facility with 20+ employees. Responsible for developing and implementing strategic business plans to drive growth of organization.

- Ensured that engineering projects and product development process conformed to ISO 9000 standards
- Spearheaded contract negotiations with customers and suppliers, and formalized business loans
- Drove continuous improvement of business and manufacturing processes
- Managed corporate purchasing of all capital equipment
- Recruited, trained, and developed all employees

PRIOR EXPERIENCE

GMR PLASTICS, INC., Livonia, MI 1986 – 1994

Plastic injection mold suppliers to Tier I and Tier II automotive customers. Produced a variety of automotive and non-automotive plastic injection molds

President

SHAPIRO MOLD, Livonia, MI 1994 – 1998

Specializes in building small, medium, and large plastic injection molds for the automotive industry

Mold Maker – Leader

METRO MOLD, Madison Heights, MI 1981 – 1984

Specializes in building small, medium, and large plastic injection molds for the automotive industry

Mold Maker

FRASER MOLD, Troy, MI 1979 – 1981

Specializes in building small, medium, and large plastic injection molds for the automotive industry

Mold Maker – Apprentice

EDUCATION

Master of Business Administration – Candidate
Lawrence Technological University

Master of Science, Industrial Operations
Lawrence Technological University

Bachelor of Art, Technology Management
Lawrence Technological University

Bachelors in Engineering
Leningrad Construction Architectural & Engineering College

James D. Smith
6899 Crcloo: Rd.
Fowlerville, Mich. 48836
(517) 223-8735 (home)
(586) 947-3521 (work)

EDUCATION

The University of Michigan — Ann Arbor, Michigan
Graduate School of Business Administration.
- Master of Business Administration, April, 1988.
- Accomplished through the Evening Program.

General Motors Institute — Flint, Michigan
- Bachelor of Science in Mechanical Engineering, 1969
- Automotive Engineering.
- Sponsored by Chevrolet Engineering (co-op program).

TEACHING EXPERIENCE

Baker College of Owosso — 1996-97 — Owosso, Michigan
- Financial Management
- Organizational Dynamics

Cleary University — 1993-1994 and 2000-2001 — Howell, Michigan
- Beginning Algebra
- Intermediate Algebra
- Introduction to Statistics
- Introduction to Business
- Beginning Accounting

EXPERIENCE: GENERAL MOTORS CORPORATION

1988-Current — Lansing Automotive Division/SCG/NA Engineering — Warren, Michigan
Engineering Group Manager -- Body Group (Doors).
- Plan staffing requirements, select and train group members.
- Manage design, development, validation, and release of door systems.
- Managed design and release of 1995 Cavalier/Sunfire Doors.
- Managed design and release of Ion, Cobalt, and HHR Doors.

1987-88 — CPC Capital Management — Warren, Michigan
Administrator
- Part of and Engineering/Financial cross-training program.
- Coordinated CPC quarterly Capital Spending Forecast.
- Reviewed and coordinated Canadian and Mexican capital projects.
- Represented Financial Department to Engine Business Teams.

1978-87 — Chevrolet/CPC Engineering — Warren, Michigan
Design/Release Engineer
- Coordinate between Engine group and various car lines.
- Managed design, development, and release of various engine systems (accessory drive, induction, emission controls).
- Coordinated changes between engine plants in three countries.

1974-78 — Chevrolet Emissions Development — Milford, Michigan
Development Engineer
- Developed engine control calibrations, including first Chevrolet V-6.
- Demonstrated compliance to Federal and California emission laws.
- Validated driveability in extreme ambient temperatures and altitudes.

1969-74 — Chevrolet V-8 Engine — Flint, Michigan
Contact Engineer
- Represented Chevrolet Engineering Center to V-8 Engine Plant.
- Resolved quality and manufacturing concerns.
- Implemented design changes in production.

SECTION 3 ATTACHMENTS – Part 4

The following 25 pages are the Comprehensive Rubrics used for Assessment of Program Outcomes, along with documents which describe and support the program assessment plan.

Outcome 1: Professional Certification

Students will be prepared to demonstrate competence and general knowledge by taking any one of a number of examinations for certification. Examples of the precise examinations and respective certifications are listed in the table furnished below.

Organization	Certification	Item(s) Required	Cost
Association of Technology, Management & Applied Engineering	Technology Manager – CTM Manufacturing Specialist - CMS	Examination	$40
Society of Manufacturing Engineers	Bronze Level Lean Certification	Examination & Portfolio	$445
Project Management Institute	Project Management Professional - PMP	Examination	$405
American Society for Quality	Quality Engineer – CQE Quality Process Analyst – CQPA Quality Auditor – CQA Six Sigma Green Belt - CSSGB	Examination	$390 $335 $390 $335

Outcome Number 2: Credible Sources of Information

Student will demonstrate the ability to seek sources of credible reference and scholarly knowledge in order to apply the information in these sources to pertinent circumstances in their daily professional activities.

CATEGORY	**Exemplary (4)**	**Accomplished (3)**	**Developing (2)**	**Beginning (1)**
Amount of Worthwhile Information Contained in Sources	ALL of the primary sources contain a lot of information about the desired topic. (pages)	Most of the primary sources contain a fair amount of information about the desired topic. (paragraphs)	Primary sources contain very little information about the desired topic. (a few sentences)	Primary sources contain no information about the desired topic.
Information Accuracy – Scholarly Nature of Information	ALL of the sources are written by experts on the desired topic.	Most of the sources are written by experts on the desired topic.	A couple of the sources are written by experts on the desired topic.	It is uncertain who wrote any of the sources or if they are an expert on the desired topic.
Ease of Comprehension	The student understood ALL of the sources completely.	The student understood almost all of the sources, except for a few words.	The student understood some of the information in the sources, but some was too difficult to understand without assistance.	The student did not understand a lot of the information contained within the sources.
Currency of Source Information	All of the sources have been written within the last 2 years.	Most of the sources were written in the past 2 years.	Most of the sources were written within the last 10 years.	Most of the sources are over 10 years old.
Factual Nature of Sources	The sources contain facts and statistics, not opinions.	The sources have many facts and statistics, but also some opinion.	The sources contain an equal amount of facts and opinions.	The sources contain mostly opinion with few facts and statistics.
Individual Learning	Illustrates excellent student ownership of individual learning 100% of the time.	Illustrates ownership of individual learning consistently to complete all tasks and assignments.	Illustrates ownership of individual learning on occasion, when convenient.	Illustrates ownership of individual learning only when monitored by the teacher.

Outcome 3: Decision Making and Critical Thinking

Solve problems and make decisions through thinking logically, critically, and creatively

TRAIT	Unacceptable	Acceptable	Exemplary
Identifies and Summarizes the problem at issue	Does not identify and summarize the problem, is confused or identifies a different or inappropriate problem	Identifies the main problem and subsidiary, embedded, or implicit aspects of the problem	Identifies not only the basics of the issue, but recognizes nuances of the issue
Personal perspective and position	Addresses a single source or view of the argument and fails to clarify presented position relative to one's own	Identifies, appropriately, one's own position on the issue	Draws support from experience and information not available from assigned sources
Other salient perspectives and positions	Deals only with a single perspective and fails to discuss other salient perspectives	Identifies other salient perspectives drawn from outside information	Addresses and analyzes salient perspectives drawn from outside information
Key assumptions	Does not surface the assumptions and ethical issues that underlie the issue	Identifies some of the key assumptions and ethical issues	Identifies and questions the validity of the key assumptions and addresses the ethical dimensions that underlie the issue
Quality of evidence	Merely repeats information provided, taking it as truth or denies evidence without adequate justification	Examines the evidence and source of evidence, questions its accuracy, precision, relevance, and completeness	Observes cause and effect and addresses existing or potential consequences. Clearly distinguishes between fact, opinion, and acknowledges value judgments
Conclusions, implications, and consequences	Fails to identify conclusions, implications, and consequences of the issue	Identifies and discusses conclusions, implications, and consequences	Objectively reflects upon own assertions
Identifies Alternatives	Identifies alternatives that are not all seemingly equal or that reflect confusion or limited understanding of the situation	Identifies alternatives that are seemingly equal and that reflect a basic understanding of the situation	Identifies alternatives that are seemingly equal and that reflect an in-depth understanding of the situation
Identifies criteria for assessing alternatives	Identifies only some important criteria	Identifies the important criteria that should be considered	Identifies important and less obvious criteria reflecting a thorough understanding of the situation
Applies criteria to alternatives	Determines the extent to which some of the alternatives possess each criterion or the extent to which all of the alternatives possess some of the criteria	Determines the extent to which each alternative possesses each criterion and justifies this with appropriate information or knowledge	Determines the extent to which each alternative possesses each criterion and justifies this with appropriate information or knowledge at an unusual level of depth
Evaluates results	Has difficulty evaluating whether important scores or criteria should be changed or dropped	Evaluates whether important scores or criteria should be changed or dropped in a way that reflects understanding of the subject	Evaluates whether important scores or criteria should be changed or dropped in a way that reflects an in-depth understanding of the subject

Outcome Number 4: Quality Improvement

Student will be prepared to demonstrate the ability to improve quality in any operational system using one of a number of methods, including but not limited to: business process re-engineering, value stream management, six sigma, theory of constraints and statistical analyses

CATEGORY	**Exemplary (4)**	**Accomplished (3)**	**Developing (2)**	**Beginning (1)**
Define – problem statement	Can formulate and communicate a problem statement with direction, business measure, and performance measures.	Can devise a problem statement with 2 of the 3 components	Can devise a problem statement with 1 of the 3 components	Unable to formulate a worthwhile problem statement
Define – process map	Can formulate and communicate a process map that includes people, tasks, and time frames	Can devise a process map with 2 of the 3 components	Can devise a process map with 1 of the 3 components	Unable to formulate a worthwhile a process map
Measure --- data collection	Can use a proper data collection tool, data sample, data sample tool, and summarized results	Can use 3 of the 4 components of data collection	Can use 2 of the 3 components of data collection	Unable to use data collection components without direction or assistance
Measure – understanding of data	Demonstrates a full comprehension and understanding of variance in data sources, is able to rationalize the impact of variability	Can demonstrate comprehension and understanding of variance, but may not have the depth of skills to explain variability beyond simple SPC control charts	Demonstrates limited comprehension or understanding of variance in data sources, and cannot identify variability	Can use only limited data tools for the understanding of variance, or variability
Analyze – data presentation	Can formulate, document and present appropriate graphs, tables and/or illustrations for the collected data. Detail is sufficient for figures to stand alone.	Can formulate, document and present graphs, tables and/or illustrations. Figures contain useful information but may not be able to stand alone without supporting text.	Can formulate, document and present some graphs, tables or illustrations, but data may not be presented in proper fashion or appropriate for the situation.	Unable to present data without significant direction. Identifying trends and commonality to the data is difficult.

Analyze --- root cause	Can use and explain 2 or more root cause tools and their respective applications for appropriateness; outcome is included	Can use and explain 1 root cause tool and its respective applications for appropriateness; outcome is included	Can use or explain 1 root cause tools and its application for appropriateness; outcome is not included	May not be able to use a root cause tool
Improve --- solutions	Demonstrates and communicates the decision that needs to be made, use of more than one solution generating tools, and 7-9 potential solutions	Demonstrates and communicates the decision that needs to be made, use of 1 solution generating tools, and 5-6 potential solutions	Demonstrates and communicates some of the following: the decision that needs to be made, use of 1 or more solution generating tools, and 5-6 potential solutions	Demonstrates and communicates few of the following: the decision that needs to be made, use of 1 or more solution generating tools, and 5-6 potential solutions
Improve --- decisions	Demonstrates and communicates the use of 2 or more decision-making tools, a description of the tools and a description of the solution	Demonstrates and communicates the use of 1 decision-making tool, a description of the tool and a description of the solution	Demonstrates and communicates some of the following: use of a decision-making tool, a description of the tool and a description of the solution	May not be able to use, describe or communicate the following without assistance: use of a decision-making tool, a description of the tool and a description of the solution
Implement	Demonstrates and communicates a complete detailed action plan and 8-9 action steps with realistic timeline	Demonstrates and communicates a complete detailed action plan and 5 – 7 action steps with somewhat vague timeline	Demonstrates and communicates an incomplete action plan, very little appropriate detail or 4-6 action steps	May not be able to demonstrate and communicates an action plan or more than 3 action steps without direction and assistance
Control	Demonstrates the skill to track 6-7 outputs, use 2 or more control charts, and provide a sample of one chart	Demonstrates the skill to track 3-5 outputs, use a control chart, and provides a sample of chart	Demonstrates the skills for 2 of the 3 components of control	Unable to demonstrate the skill to use 2 of the 3 components of control
Mechanics - communication	Demonstrates the skill to present and explain attachments as needed, general flow of work is professional	Demonstrates the skill to present and explain many of the following items: attachments as needed, general flow of work is professional	Demonstrates the skill to present and explain some of the following items: attachments as needed, general flow of work is professional	Unable to demonstrate the skill to present and explain their work

Outcome Number 5 – Financial and Economic Analysis

Perform economic analyses to select alternatives for highest return or lowest cost

Category	Exemplary (4)	Accomplished (3)	Developing (2)	Beginning (1)
Financial Analysis	Demonstrates the skills for proper calculations, ratios and financial statement analysis by category, number and percentage.	Demonstrates the skills for proper calculations and notes differences on financial statements by number and percentage	Demonstrates the skills for proper calculations and sets up analysis of financial statements	May be unable to demonstrate proper financial calculations
Comparison to past performance	Can identify multiple trends from both vertical, horizontal and ratio analysis and is able to relate them to each other	Can determine at least 2 trends, and can relate them to financial statements.	Is able to identify growth and slowing trends from income statement	Is barely able to identify any trends in financial data.
Investment Decision-Making	Can demonstrate multiple pay back methodologies with correct calculations including present worth, simple pay-back and rate of return	Can demonstrate some pay back methodologies with correct calculations including present worth, simple pay-back and rate of return	Can demonstrate a single pay back methodology with correct calculations such as present worth, simple pay-back and rate of return	May not be able to demonstrate complex financial calculations involving pay back
Complex Cost Accounting	Demonstrates the ability to identify the multiple components which comprise a product or service, including raw materials, subassemblies, labor, overhead, and processing costs	Demonstrates the ability to identify many of the multiple components which comprise a product or service, including raw materials, subassemblies, labor, overhead, and processing costs	Understands there exists multiple components which comprise a product or service, including raw materials, subassemblies, labor, overhead, and processing costs	May not be able to break down the cost of a product or service into various components without assistance

Outcome Number 6: Manufacturing Improvement

Analyze production and administrative systems, machines/methods, and processes using fundamental technical principles and analyses and be able to improve the productivity of these operational systems

Category	Exemplary (4)	Accomplished (3)	Developing (2)	Beginning (1)
Generalization of lean principles and their application in specific settings.	Students can apply all principles of lean thinking: • Value • Flow • Pull • Perfection giving clear definitions of their meaning and/or give examples of their applications on specific cases.	Students can apply three principles of lean thinking giving definitions of their meaning and/or give examples for the application of these three principles.	Students can apply two principles of lean thinking, giving definitions of their meaning and/or give examples for the application of these two principles.	Students can barely apply one principle of lean thinking, giving definition of its meaning and/or give examples for the application of this principle.
Appraisal of the links between various lean tactics.	Students are able to fully identify 7 tactics in a given ordering scheme and/or explain the logic of its sequence.	Students can satisfactorily identify given ordering schemes, identifying the correct order of five tactics and/or explaining the logic of its sequence.	Students can partially identify one of the existing ordering schemes, identifying the correct order of three tactics and/or explaining the logic of its sequence.	Students can barely identify one of the existing ordering schemes, identifying the correct order of two tactics and/or explaining the logic of its sequence.
Application of lean tactics in the solution of lean problems	Students can completely solve specific lean problems applying the seven tactics, through the definition of their meaning and/or using examples as specific solution alternatives for the seven tactics.	Students can satisfactorily solve specific lean problems applying five tactics, through the definition of their meaning and/or using examples for these five tactics.	Students can partially solve specific lean problems applying three tactics, through the definition of their meaning and/or using examples for these three tactics.	Students can barely solve specific lean problems applying two tactics, trough the definition of their meaning and/or using examples for these two tactics.

5-S Understanding & Implementation	Can name and explain clearly the 6 steps involved in implementing a 5-S program, demonstrates adeptness at leading a 5-S initiative and is able to explain at least 4 benefits and 4 challenges in implementation of a 5-S program.	Can name and explain clearly 4-5 of the 6 steps involved in implementing a 5-S program, demonstrates adeptness at leading a 5-S initiative and is able to explain at least 3 benefits and 3 challenges in implementation of a 5-S program.	Can name and explain clearly up to 3 of the 6 steps involved in implementing a 5-S program, demonstrates adeptness at leading a 5-S initiative and is able to explain at least 2 benefits and 2 challenges in implementation of a 5-S program.	Can explain the 5-S program, and is able to explain 1 of the benefits and 1 of the challenges in implementation of a 5-S program.
Value Stream Mapping	Can analyze and assess a current state for product or service flow in terms of inventory, output, product flow and create both a current state map and future state map for measureable improvements regarding 6 or more manufacturing metrics.	Can analyze and assess a current state for product or service flow in terms of inventory, output, product flow and create both a current state map and future state map for measureable improvements regarding 3-5 manufacturing metrics.	Can analyze and assess a current state for product or service flow in terms of inventory, output, product flow and create both a current state map and future state map for measureable improvements regarding 1-2 manufacturing metrics.	Can analyze and assess a current state for product or service flow in terms of inventory, output, product flow and create a current state map. A future state map can be created with assistance that represents measurable improvements for at least 1 manufacturing metric.
PDCA (PDSA) Cycle	Can explain and document a PDCA cycle for an activity or series of activities. Shows adeptness at all 4 of the activities in the cycle including planning, execution, checking and follow up action with proper documentation.	Can explain and document a PDCA cycle for an activity or series of activities. Shows adeptness at 3 of the 4 of the activities in the cycle.	Can explain and document a PDCA cycle for an activity or series of activities. Shows adeptness at 2 of the 4 of the activities in the cycle.	Can explain a PDCA cycle for an activity or series of activities. Requires assistance with documentation matters and/or execution.

Root Cause Analysis and Assessment (RCA)	Can identify and explain the significance of potential factors in a common problem. Is able to demonstrate RCA through the charting of quality tools data, analysis and interpretation of the data. Can clearly explain and demonstrate approaches to root cause techniques including FMEA and “5-Why” methods.	Can participate in brainstorming to determine potential factors in a common problem. Is able to demonstrate RCA through the charting of quality tools data, analysis and interpretation of the data. Can explain and demonstrate one of the approaches to root cause techniques including FMEA and “5-Why” methods.	Can participate in brainstorming to determine potential factors in a common problem. Can explain and demonstrate one of the approaches to root cause techniques including FMEA and “5-Why” methods.	Can participate in brainstorming to determine potential factors in a common problem.
Manufacturing Metrics	Can identify, name and explain 10 of the 12 measurable elements in common lean manufacturing metrics. Is able to describe, compute, track, graph, communicate these metrics, and can recognize trends and implement worthwhile solutions for their respective improvement.	Can identify, name and explain 8-9 of the 12 measurable elements in common lean manufacturing metrics. Is able to describe, compute, track, graph, communicate these metrics, and can recognize trends and implement worthwhile solutions for their respective improvement.	Can identify, name and explain 5-7 of the 12 measurable elements in common lean manufacturing metrics. Is able to describe, compute, track, graph, communicate these metrics, and can recognize trends and implement worthwhile solutions for their respective improvement.	Can identify, name and explain 4 or fewer of the 12 measurable elements in common lean manufacturing metrics. Is able to describe, compute, track, graph, communicate these metrics, and can recognize trends and implement worthwhile solutions for their respective improvement.
DMAIC & Six Sigma Methodologies	Demonstrates a comprehensive knowledge of the metrics, definition, measurement, appropriate and complete data analysis tools with proper calculations of Six-Sigma methodologies with adequate presentation skills. Can apply appropriate stabilization, improvement and control methods and maintenance of improvements in proper settings.	Demonstrates a comprehensive knowledge of up to 3 of the following: metrics, definition, measurement, appropriate and complete data analysis tools with proper calculations of Six-Sigma methodologies with adequate presentation skills. Can apply appropriate stabilization, improvement and control methods and maintenance of improvements in limited settings.	Can explain up to 2 of the following: metrics, definition, measurement, appropriate and complete data analysis tools with proper calculations of Six-Sigma methodologies with adequate presentation skills. Can apply appropriate stabilization, improvement and control methods and maintenance of improvements in some settings with assistance.	Can explain one of the following: metrics, definition, measurement, appropriate and complete data analysis tools with proper calculations of Six-Sigma methodologies with adequate presentation skills. Can understand appropriate stabilization, improvement and control methods and maintenance of improvements in some settings with assistance.

Outcome Number 7: Time/Motion, Layout, Material Handling

Analyze production and administrative systems, machines/methods, and processes using fundamental technical principles and analyses and be able to improve the productivity of these operational systems

Category	Exemplary (4)	Accomplished (3)	Developing (2)	Beginning (1)
History of Manufacturing	Can explain the development and significance of types of manufacturing operations including craft/mass/lean movements, along with identify and explain the important contributions of the 4 key historical figures in the development of modern manufacturing assembly methods.	Can explain the development and significance of types of manufacturing operations including craft/mass/lean movements, along with identify and explain the important contributions of 2 of the 4 key historical figures in the development of modern manufacturing assembly methods.	Can explain the types of manufacturing operations including craft/mass/lean movements, along with identify and explain the important contributions of 1 of the 4 key historical figures in the development of modern manufacturing assembly methods.	With assistance, can explain the types of manufacturing operations including craft/mass/lean movements.
5-S Understanding & Implementation	Can name and explain clearly the 6 steps involved in implementing a 5-S program, demonstrates adeptness at leading a 5-S initiative and is able to explain at least 4 benefits and 4 challenges in implementation of a 5-S program.	Can name and explain clearly 4-5 of the 6 steps involved in implementing a 5-S program, demonstrates adeptness at leading a 5-S initiative and is able to explain at least 3 benefits and 3 challenges in implementation of a 5-S program.	Can name and explain clearly up to 3 of the 6 steps involved in implementing a 5-S program, demonstrates adeptness at leading a 5-S initiative and is able to explain at least 2 benefits and 2 challenges in implementation of a 5-S program.	Can explain the 5-S program, and is able to explain 1 of the benefits and 1 of the challenges in implementation of a 5-S program.

Standard Work	Can break down a task or series of tasks into work elements, and properly document these elements. Demonstrates knowledge of common ergonomic matters involving human workers including repetitive motion trauma and how this occurs. Can offer more than one potential solution to a potential problem area and properly document the changes in a standard work document.	Can break down a simple task or series of simple tasks into work elements, and properly document these elements. Demonstrates knowledge of common ergonomic matters involving human workers including repetitive motion trauma and how this occurs. Can offer a single solution to a potential problem area and properly document the changes in a standard work document.	With assistance, can break down a simple task or series of simple tasks into work elements, and properly document these elements. Demonstrates knowledge of common ergonomic matters involving human workers including repetitive motion trauma and how this occurs. Cannot offer a solution to a potential problem area but can properly document the changes in a standard work document.	Cannot break down a simple task or series of simple tasks into work elements, or properly document these elements. Cannot offer a solution to a potential ergonomic problem area.
Kaizen Improvement Initiatives	Can explain clearly the history, intent and implementation of all 6 steps involved in Kaizen improvement activities. Is able to demonstrate adeptness at leading a Kaizen improvement event through execution, documentation and follow up for implementation of floor-level improvements.	Can explain clearly the history, intent and implementation of 4-5 of the 6 steps involved in Kaizen improvement activities. Is able to demonstrate adeptness at leading a Kaizen improvement event through execution, documentation and follow up for implementation of floor-level improvements.	Can explain clearly the history, intent and implementation for up to 3 of the 6 steps involved in Kaizen improvement activities. Is able to demonstrate adeptness at participation in Kaizen improvement events.	Can explain clearly the history, intent and implementation for 2 or fewer of the 6 steps involved in Kaizen improvement activities.

Line Balancing & Production Capacity	Can identify and explain all 8 elements of a production assembly line balancing problem, including: efficiency, work elements, flow/cycle time, sequence, precedence diagrams, bottlenecks/constraints, workstation and manpower requirements. Can diagram the results of a given situation and offer improvements that improve the overall production throughput of the operation. Can determine the overall production capacity of an operation diagram and compute the needs of a facility in terms of machine and manpower requirements.	Can identify and explain 5-7 elements of a production assembly line balancing problem. Can diagram the results of a given situation and offer improvements that improve the overall production throughput of the operation. Can determine the overall production capacity of an operation diagram and compute the needs of a facility in terms of machine and manpower requirements.	Can identify and explain up to 4 elements of a production assembly line balancing problem. Can diagram the results of a given situation and offer improvements that improve the overall production throughput of the operation. Can determine the overall production capacity of an operation diagram and compute the needs of a facility in terms of machine and manpower requirements.	With assistance, can identify and explain up to 2 elements of a production assembly line balancing problem. With assistance, can diagram the results of a given situation and offer improvements that improve the overall production throughput of the operation. With Assistance, can determine the overall production capacity of an operation diagram and compute the needs of a facility in terms of machine and manpower requirements.
Floor Layout Improvement	Can demonstrate accurate and successful use of various plant layout tools including: affinity diagrams, dimensionless block diagrams and cellular layouts; Can demonstrate reasonable implementation plans, coordination of multiple efforts; Is able to explain in detail the importance of monument fixtures and other constraints; Is able to explain at least 4 pros and 4 cons of any given floor layout.	Can demonstrate accurate and successful use of various plant layout tools including 2 of these: affinity diagrams, dimensionless block diagrams and cellular layouts; Can demonstrate reasonable implementation plans, coordination of multiple efforts; Is able to explain in detail the importance of monument fixtures and other constraints; Is able to explain at least 2 pros and 2 cons of any given floor layout.	Can demonstrate accurate and successful use of a cellular layout; Can demonstrate a reasonable implementation timeline; Is able to explain in detail the importance of monument fixtures and other constraints; Is able to explain at least 1 pro and 1 con of any given floor layout.	Can demonstrate accurate and successful use of a cellular layout.

Material Handling Assessment and Improvement	Is able to document, present or demonstrate and explain a Process flow chart; Can demonstrate knowledge in materials handling including: requirements, warehousing, inventory requirements, location, transport system(s), information retrieval, throughput, inventory turns.	Is able to document, present or demonstrate and explain a Process flow chart; Can demonstrate knowledge in at least 6 of the 8 materials handling topics including: requirements, warehousing, inventory requirements, location, transport system(s), information retrieval, throughput, inventory turns.	Is able to document, present or demonstrate, or explain a Process flow chart; Can demonstrate knowledge in at least 4 of the 8 materials handling topics including: requirements, warehousing, inventory requirements, location, transport system(s), information retrieval, throughput, inventory turns.	Is able to explain a Process flow chart; Can demonstrate knowledge in at least 2 of the 8 materials handling topics including: requirements, warehousing, inventory requirements, location, transport system(s), information retrieval, throughput, inventory turns.

Industrial Safety	Is able to explain the significance, dangers and abatements of the following industrial safety related topics: Confined spaces, Exposure, Hazardous substances, Moving Machinery, Personal protective devices, Electrical hazards, Lockout/Tagout procedures, Pressurization, Thermal dangers, MSDS Laws and Compliance, Repetitive motion disorders	Is able to explain the significance, dangers and abatements of 9-10 of the following industrial safety related topics: Confined spaces, Exposure, Hazardous substances, Moving Machinery, Personal protective devices, Electrical hazards, Lockout/Tagout procedures, Pressurization, Thermal dangers, MSDS Laws and Compliance, Repetitive motion disorders	Is able to explain the significance, dangers and abatements of 6-8 of the following industrial safety related topics: Confined spaces, Exposure, Hazardous substances, Moving Machinery, Personal protective devices, Electrical hazards, Lockout/Tagout procedures, Pressurization, Thermal dangers, MSDS Laws and Compliance, Repetitive motion disorders	Is able to explain the significance, dangers and abatements of 5 or fewer of the following industrial safety related topics: Confined spaces, Exposure, Hazardous substances, Moving Machinery, Personal protective devices, Electrical hazards, Lockout/Tagout procedures, Pressurization, Thermal dangers, MSDS Laws and Compliance, Repetitive motion disorders

Outcome 8: Communication Skills – Oral and Written

Be able to communicate effectively, clearly and precisely in both written and oral formats

CATEGORY	**Exemplary (4)**	**Accomplished (3)**	**Developing (2)**	**Beginning (1)**
Coherence – Writing	The writer provides clear and consistent movement within and between paragraphs	The writer provides movement within and between paragraphs and from beginning to end.	The writer provides movement within and between paragraphs and from beginning to end, but this movement is at times either unclear or awkward.	The writer provides little movement within and between the paragraphs and from beginning to end.
Accuracy – Writing	The writer's knowledge of the subject is accurate throughout.	The writer's knowledge of the subject is accurate throughout except in minor details.	The writer's knowledge of the subject is generally accurate, though flawed.	The writer's knowledge of the subject is generally inaccurate.
Extensiveness – Writing	The writer exhibits convincing range and quality of knowledge, having done appropriate research, if applicable.	The writer seems informed on the subject, having done appropriate research, if applicable.	The writer exhibits limited range or quality of knowledge, having done minimal appropriate research, if applicable.	The writer's knowledge of the subject lacks range or quality.
Figures and Tables – Writing	Figures and tables are used effortlessly to enhance paper. Figures are clear and self-explanatory with appropriate numbers and detailed captions.	Appropriate number of figures and/or data tables. Figures fit well, but may require some explanation.	Does not offer additional insight or information beyond figures or tables. Figures difficult to see or poor in quality.	Some key points do NOT have a corresponding figure or data table. Figures are notably absent or incomplete.
Grammar Skills - Writing	The text is clearly legible. The format is both appropriate and attractive. The writer misspells no or very few words.	The text is clearly legible. The format is appropriate. The writer's misspellings are few in proportion to the length and complexity of the text.	The text is generally legible. The format is acceptable. The writer makes several misspellings in proportion to the length and complexity of the text.	The text is generally illegible. The format is unacceptable. The writers misspellings are frequent enough to be distracting, regardless of the length or complexity of the text.
Organization – Oral	Has a clear opening statement that catches audience's interest. Uses outline and stays focused throughout.	Opening is clear and may catch the interest of the audience, but the outline may not pertain fully to the topic.	Has opening statement relevant to topic, and gives outline of speech. Mostly organized, loses focus only once or twice.	No opening statement, or irrelevant statement. Loses focus more than twice.
Content – Oral	Well prepared with relevant research and is able to show the objectives of the presentation and assignment throughout.	Is more thorough than "average." Research goes beyond minimum requirements.	Fulfills assignment. Current. Uses appropriate sources and is objective.	Does not meet assignment requirements, is not current, nor objective.
Use of Media and Illustrations – Oral	Slides are used effortlessly to enhance speech. Speech could be effectively delivered without them. Figures are clear and self-explanatory.	Looks at slides to keep on track with presentation. Appropriate number of slides. Figures fit well, but may require some explanation.	Primarily reads the information contained on the slides. Does not offer additional insight or information beyond slides. Figures difficult to see or poor in quality.	Relies heavily on slides or notes. Makes little eye contact. Some key points do NOT have a corresponding slide. Figures are notably absent or incomplete.
Voice Quality and Pace – Oral	Excellent delivery. Modulates voice, projects enthusiasm, interest, confidence.	Can easily understand -- appropriate pace and volume.	Audience can mostly understand the presenter and the topic, but inconsistency is present.	Demonstrates one or more of the following: mumbling, hard to understand English, too soft, too loud, too fast, too slow.
Quality of Conclusions – Oral	Goes beyond "average" in delivering a conclusion that is very well documented and persuasive.	Above average in delivering a conclusion that is mostly documented and persuasive.	Adequate. Summarizes presentation's main points, and draws conclusions based upon these points.	Missing or poor. Not tied to analysis. Does not summarize points that brought the speaker to this conclusion.
Mannerisms – Oral	Uses body language effectively to maintain audience's interest.	Has competence, but may lack audience engagement in delivery.	No distracting mannerisms. Decent posture. Spends a significant amount of time in a single position.	Demonstrates one or more distracting mannerisms, which may include bad posture.

Outcome Number 9: Leadership & Project Management

The student will demonstrate leadership and project management skills to lead subordinates and teams

CATEGORY	**4 – Exemplary**	**3 – Accomplished**	**2 – Developing**	**1 - Beginning**
Quality of Work	Provides work of the highest quality.	Provides high quality work.	Provides work that occasionally needs to be checked/redone by other group members to ensure quality.	Provides work that usually needs to be checked/redone by others to ensure quality.
Time-management	Routinely uses time well throughout the project to ensure things get done on time. Group does not have to adjust deadlines or work responsibilities because of this person's procrastination.	Usually uses time well throughout the project, but may have procrastinated on one thing. Group does not have to adjust deadlines or work responsibilities because of this person's procrastination.	Tends to procrastinate, but always gets things done by the deadlines. Group does not have to adjust deadlines or work responsibilities because of this person's procrastination.	Rarely gets things done by the deadlines AND group has to adjust deadlines or work responsibilities because of this person's inadequate time management.
Problem-solving	Actively looks for and suggests solutions to problems; consistently monitors and upholds majority decisions	Refines solutions suggested by others; monitors and upholds majority decisions with apparent hesitation/dismay	Does not suggest or refine solutions, but is willing to try out solutions suggested by others; argues with others when expected to uphold majority decisions	Does not try to solve problems or help others solve problems. Lets others do the work. Does not uphold majority decisions; abuses power.
Attitude	Never is publicly critical of the project or the work of others. Always has a positive attitude about the task(s).	Rarely is publicly critical of the project or the work of others. Often has a positive attitude about the task(s).	Occasionally is publicly critical of the project or the work of other members of the group. Usually has a positive attitude about the task(s).	Often is publicly critical of the project or the work of other members of the group. Often has a negative attitude about the task(s).
Focus on the task	Consistently stays focused on the task and what needs to be done. Very self-directed.	Focuses on the task and what needs to be done most of the time. Other group members can count on this person.	Focuses on the task and what needs to be done some of the time. Other group members must sometimes nag, prod, and remind to keep this person on-task.	Rarely focuses on the task and what needs to be done. Lets others do the work.

Preparedness	Brings needed materials to class and is always ready to work; plans for contingency in case of absent or forgotten resources	Almost always brings needed materials to class and is ready to work; struggles but creates contingency in case of absent or forgotten resources.	Almost always brings needed materials but sometimes needs to settle down and get to work; plans contingency with great struggle and delay when faced with absent or forgotten resources.	Often forgets needed materials or is rarely ready to get to work; does not develop contingency plan to accommodate for absent or forgotten resources.
Leadership & Delegation	Maintains self-confidence and demonstrates most appropriate delegation of responsibility to each member of the group, planning for all to be involved	Variable self-confidence; delegates responsibilities to group members with obvious hesitation	Minimal confidence in leadership role; delegates duties with obvious bias and hesitantly involves all members of the group.	No demonstration of leadership responsibility; does not delegate duties to group members; does not maintain involvement of all group members
Monitors Group Effectiveness	Routinely monitors the effectiveness of the group, and makes suggestions to make it more effective.	Routinely monitors the effectiveness of the group and works to make the group more effective.	Occasionally monitors the effectiveness of the group and works to make the group more effective.	Rarely monitors the effectiveness of the group and does not work to make it more effective.
Working with Others	Almost always listens to, shares with, and supports the efforts of others. Tries to keep people working well together.	Usually listens to, shares, with, and supports the efforts of others. Does not cause "waves" in the group.	Often listens to, shares with, and supports the efforts of others, but sometimes is not a good team member.	Rarely listens to, shares with, and supports the efforts of others. Often is not a good team player.

Contributions	Routinely provides useful ideas when participating in the group and in classroom discussion. A definite leader who contributes a lot of effort.	Usually provides useful ideas when participating in the group and in classroom discussion. A strong group member who tries hard!	Sometimes provides useful ideas when participating in the group and in classroom discussion. A satisfactory group member who does what is required.	Rarely provides useful ideas when participating in the group and in classroom discussion. May refuse to participate.
Confidence	Uses strong verbal and non verbal behavior to convey authority and concern	Looks comfortable and confident in exercising leadership duties	Shows a tendency toward uncertainty and cannot portray a confident disposition in a regular manner	Gives an impression of reluctance or uncertainty about exercising leadership

Ability to Listen	Provides summary of important discussions at regular intervals	Listens actively and shows understanding by paraphrasing or by acknowledging and building on others' ideas.	Can listen at times, but chooses to ignore much of the input of others.	Asks for ideas or suggestions but neglects to consider them.
Stays on Track	Develops and adheres to a calendar of activities and/or checklists.	Keeps group on track by managing time, providing coaching or guidance, or resolving differences as needed. Intervenes when tasks are not moving toward goals	Can stay on track with occasional reminders, but often gets distracted easily.	Lets the group ramble or stray off track too much, or keeps the group so rigidly on track that relevant issues or concerns are ignored.

Outcome 10: Teamwork

Explain and demonstrate the importance of teamwork in solving typical problems in a business or industrial environment

TRAIT	Exemplary (4)	Accomplished (3)	Developing (2)	Beginning (1)
Understanding of Team Dynamics	Assists the team members in the stages of development, actively assigns roles and responsibilities	Eagerly joins the team and accepts their role	Joins a group cooperatively	Shows a lack of involvement in the team
Commitment	Follows up on ideas and suggestions from previous meetings and reports findings to the group	Consistently demonstrates commitment to the project by being prepared for each group meeting.	May not be prepared for all team meetings and assignments. Can neglect responsibilities at times.	Seems reluctant to engage fully in discussions and task assignments.
Balance between task and interpersonal relationships	Volunteers to assist others and shares information openly.	Balances the need for task accomplishment with the needs of individuals in the group	Can allow personality conflicts to interfere with task completion or the needs of the group at large.	Focuses exclusively on task to be accomplished without regard to team members or focuses exclusively on interpersonal relations without regard to task
Contributions	Listens actively and shows understanding by paraphrasing or by acknowledging and building on others' ideas.	Frequently offers helpful ideas or suggestions.	Reluctant to offer suggestions or ideas. Generally contributes.	Does not offer ideas or suggestions that contribute to problem solving.
Listening and Engagement	Listens, respects the point of view of others, and uses the ideas of others to develop novel problem solving methods.	Will listen and generally respects the point of view of others.	Will listen attentively. Generally agrees with the majority view, but offers little else	Appears mostly aloof in team discussions.
Understanding the Importance of Consensus	Actively assists the team in developing priorities and the impact of team decisions on the overall goal(s) of the group. Acknowledges the minority positions in the overall tasks and goals and helps to reflect those in the final product.	Can understand the majority as well as minority positions within the group – and can persuade others in building a consensus.	Agrees on goals, priorities and procedures, but would rather not 'make-waves' by offering dissent.	Shows general disagreement with any other viewpoint than their own. Stalls progress as a result.
Individual Accountability and Reliability	Takes full responsibility for not only their own tasks, but for the group as a whole, encouraging and assisting others.	Is reliable and completes tasks within a timely fashion.	Tasks are often incomplete, and require assistance from others.	Tasks are rarely complete, and the individual shows a lack of respect for others' time.
Stays on Track	Uses tact and diplomacy to alert group that focus has strayed from the task at hand	Introduces suggestions and ideas that are relevant to the task	Neither engages in the group nor detracts from the group's tasks	Takes the group off track by initiating conversations or discussions unrelated to the task

Outcome Number 11: Management Methods and Principles

Students can offer insight into theoretical and practical approaches to management and applying managerial knowledge within dynamic and competitive industrial environments

Category	Exemplary (4)	Accomplished (3)	Developing (2)	Beginning (1)
Demonstrates Critical Thinking	Accurately interprets key information and questions with ease. Thoughtfully analyzes alternate solutions & point of views. Consistently draws warranted conclusions. Justifies and explains reasoning.	Accurately interprets key information and questions. Explores alternative solutions and point of views. Competently uses deductive and inductive skills. Can justify and explains reasoning.	Misinterprets information or questions. Ignores alternative solutions or point of views. Deductive and inductive skills are weak. Seldom explains reasons.	Does not identify or is confused by the issue, or represents the issue inaccurately. Exhibits close-mindedness or hostility to reason.
Demonstrates Knowledge, Application and Synthesis of the Development and Historical Context of the Field of Management	Can name and explain the significant contributions of at least 8 important historical figures in the field of management. Can demonstrate an understanding of which specific 'theories' can apply in given situations, and can formulate plans for changing the culture of an organization based on these contributions.	Can name and explain the significant contributions of 5-6 important historical figures in the field of management. Can demonstrate an understanding of which specific 'theories' can apply in given situations, and can formulate plans for changing the culture of an organization based on these contributions.	Can name and explain the significant contributions of 3-4 important historical figures in the field of management. Can demonstrate an understanding of which specific 'theories' can apply in some situations, and with assistance can formulate plans for changing the culture of an organization based on these contributions.	Can name and explain the significant contributions of 2 or fewer important historical figures in the field of management. With assistance can explain which specific 'theories' can apply in some situations.
Demonstrates Problem Solving	Actively looks for solutions and suggests solutions to problems. May solve problem on own or offer suggestions to solve problems.	Seeks solutions from others as starting point for own solution. Makes changes to a suggested solution.	Offers no problem solving suggestion but is willing to follow the plan of others. Asks others to solve problem so he/she will have a plan to follow.	Does not try to solve problems. Does not offer to help others solve problems. Lets others solve the problem.

Demonstrates Adequate Planning	Uses standards and research from a variety of sources as basis for plans. Includes all important details and necessary components; no important details or options are left out. Formulates realistic objective that can be evaluated. Formulates a realistic and researched budget. Formulates schedule to complete plan.	Uses standards and research as basis for plans. Includes important details and necessary components. Formulates objective. Formulates realistic budget. Formulates schedule to complete plan.	Uses previous experience only as basis for plans. Omits important details and necessary components. Formulates weak objective. Formulates haphazard budget. Formulates 'ball-park' schedule to complete plan.	Shows insufficient use of standards and research. Does not included important details or necessary components. Has no objective. Has no budget or budget is unrealistic. Schedule(s) for completion are omitted.
Demonstrates Implementation of Action Plan	Recognizes need for plan and importance of plan. Implements a plan of action that has addressed all necessary issues. Assess plan while in action and makes adjustments to the plan to ensure success.	Recognizes need for action plan. Implements a plan of action that has addressed all necessary issues.	Recognizes need for action plan. Implements a plan of action that is incomplete. Fails to address major components necessary for successful implementation.	Does not develop a plan of action or does not implement an action plan. May not recognize need for plan.
Ability to communicate and relate to diverse audiences	Information is presented (communicated) in a style & tone that is appropriate for the given audience and situation	Information is presented (communicated) in a style & tone that is appropriate for the given audience or situation	Information is presented (communicated) in a style and tone that is inappropriate for the given audience or situation	Information is presented (communicated) in a style and tone that is inappropriate for both the given audience & situation
Demonstration of Listening Skills	Always works from, recognizes and considers others ideas	Usually works from, recognizes and considers others ideas	Sometimes (subjectively) works from, recognizes, & considers others ideas	Does not work from, recognize, or consider others ideas
Demonstration of Worthwhile Contributions in Leadership Settings	Regularly provides useful ideas & actively makes group more effective. A group leader.	Usually provides useful ideas in group work & tries to make group more effective. Tries hard.	Sometimes provides useful ideas in group work & makes group more effective. Participates as required.	Rarely provides useful ideas in group work. May not participate. Does not work to make group more effective.

Demonstrates and Shows Adequate Respect to Peers and Superiors	Often makes positive comments about others and recreation. Often engages in positive behavior during work and/or participation opportunities. Rarely engages in disrespectful/ Destructive behavior. Disrespectful/ destructive behavior can be explained with logical rational and learns from the experience.	Sometimes makes positive comments about others and recreation. Generally engages in positive behavior during work and/or participation opportunities. May engage in disrespectful/destructive behavior during work and/or participation activities but learns from the experience and corrects behavior.	Keeps self from making negative comments about others and recreation. Sometimes engage in disrespectful/destructive behavior during work and/or participation activities.	Makes negative comments about others and recreation. Engages in disrespectful or destructive behavior during work or participation.
Demonstrates or Shows Potential for Adequate Responsibility in a Leadership Role	Frequently offers positive input to others and situations. Conscientiously performs and accepts tasks willingly. Displays ownership for work completed and any actions. Generally recognizes and corrects disrespectful or destructive behaviors in other staff members and participants. Verbalizes importance of responsibilities and rules.	Offers positive input to others and situations. Performs responsibilities and usually recognizes importance of task. Sometimes recognizes and corrects disrespectful or destructive behaviors in other staff members or participants.	Recognizes need to avoid negative words/actions in order to preserve self. Performs basic responsibilities. Fails to recognize and correct disrespectful or destructive behavior in other staff members or participants.	Does not take ownership for negative actions/words responsibilities. Fails to recognize and correct disrespectful or destructive behavior in other staff members or participants.
Demonstration of Initiative in Self-Management Activities	Always participates in group activities, duties or job responsibilities. Always asks questions, keeps others informed and recognizes tasks that must be completed and completes them.	Usually participates in group activities, duties or job responsibilities. Asks questions, keeps others informed and recognizes tasks that must be completed and completes them.	Sometimes participates in group activities, duties or job responsibilities. Rarely asks questions, keeps others informed or recognizes tasks that must be completed. Occasionally must be given directions and instructions.	Does not participate in group activities, duties or job responsibilities. Must be given direction and instructions on a continuous basis.

Ability to Set Goals, Identify and Manage Priorities	Understands and can explain and develop "SMART" goals. Always completes tasks on time, makes good use of time, and comes to class periods or work/meetings/events prepared.	Understands and can explain and develop "SMART" goals. Usually completes tasks on time, makes good use of time, and comes to class periods or work/meetings/events prepared.	Understands and can explain "SMART" goals. Sometimes completes tasks on time, makes good use of time, and comes to class periods or work/meetings/events prepared.	May understand, but cannot explain "SMART" goals. Does not complete tasks on time, make good use of time, or come to class periods or work/meetings/events prepared.

Outcome 12: Global Perspectives

Apply knowledge and skills in managing business internationally and analyzing complex economic, political, cultural and strategic issues involved in multinational enterprises;

TRAIT	Exemplary	Acceptable	Unacceptable
Identification of Global Factors	Clear and detailed identification of relevant factors	Some identification of most of the relevant factors	No or incomplete identification of some or all of the following relevant global factors: Economic, Cultural, Legal, demographic
Awareness of Issues of a Political Nature	Identification of issues which have impact on business decisions both domestic and abroad; Can explain mitigation methods well beyond what is reported in news media	Identification of major newsworthy issues which could impact business decisions	Incomplete identification major political factors and how these may affect business decisions
Cognizance of Cultural Factors	Fully aware of numerous cultural differences that could impact a business and its decisions. Is able to identify and initiate actions which alleviate these differences	Aware of some cultural differences which have some impact. Is able to identify only partial measures to bridge these gaps	Unaware of cultural differences that could have impact on business efforts
Analysis of Global Factors	Clear, accurate and somewhat detailed analysis of impact of relevant global factors	Some analysis of impact of global factors; some inaccuracies in analysis	No analysis of impact of relevant global issues; Erroneous analysis of impact
Application of Analysis to Management Situation	Clear application of analysis to specific management situation; valid conclusions and good recommendations given	Some application of analysis to specific management situation, weak conclusions or recommendations made	No application of analysis to specific management situation; incorrect conclusions or recommendations made.

Outcome 13: Growth, reflection and life-long learning

Understand the necessity for personal growth, self-reflection, and assessment to engage in successful professional practice and development throughout their careers

CATEGORY	**Exemplary (4)**	**Accomplished (3)**	**Developing (2)**	**Beginning (1)**
Self Management	Develops and maintains an on-line portfolio to document his/her educational growth and habits of intellectual exploration.	Participates in the development of a personal academic portfolio to document her/his educational growth and her/his habits of intellectual exploration.	Participates in the development of a personal educational plan by interacting with staff and others in shaping and refining his/her educational goals and strategies for achieving them.	Little to no thought or effort in the development of a personal educational plan.
Intellectual Engagement Beyond the Discipline	Can integrate topics from across disciplines to see and convey the interconnected nature of topics.	Can understand the cross-disciplinary nature of some topics, but may be focused on only a few specific areas.	Chooses a select few topics for further engagement, demonstrates disagreement in interconnected nature of topics.	See little need to view perspectives outside their own – is unable to offer worthwhile debate concerning connectivity.
Professional Development	Demonstrates their understanding with a multiple-prong approach, with several options including graduate school, professional certification, coursework or other training.	Respects the value of education at all levels, and is willing to discuss additional opportunities.	Recognizes the value in the degree program, but may be unwilling to explore further development without tangible benefits.	Simply wants to complete their requirements – and is often unwilling to see the benefit of additional possibilities.
Use of Outside Resources	Student belongs to one or more professional organizations, uses resources from that organization, attends networking events and engages others in its activities.	Student can seek outside sources with assistance. Would become involved with outside organizations given the correct circumstances.	Requires consistent intervention to produce relevant resources. Does not mix business time and pleasure time for any circumstance.	Sees little value in outside resources.
Personal Growth	Shows a consistent commitment to improvement in all areas of study and their own career objectives – and demonstrates that these are interconnected.	Demonstrates commitment to improvement, but does not have "excellence" as a standard in all areas of their study and/or career development.	Is generally happy where they are – and does not demonstrate a commitment to excellence in their personal growth.	Shows general apathy toward self-improvement – and this is reflected in their studies, their career plans and other aspects.

Outcome Number 14: Citizenship and Professionalism

Recognized and explain the importance of being good citizens of this country and the world at large, and to be able to conduct themselves in a highly professional manner with their skills, work output, demeanor and conduct.

CATEGORY	**Exemplary (4)**	**Accomplished (3)**	**Developing (2)**	**Beginning (1)**
Being Professional	Student presents themselves in a professional manner at all times. This includes always communicating to staff/students with respect, and keeps their work space organized and clean.	Student presents themselves in a professional manner most of the time. This includes usually communicating to staff/students with respect, and usually keeping their work space organized and clean.	Student occasionally presents themselves in a professional manner. This includes occasionally communicating to staff/students with respect, and occasionally keeps their work space organized and clean.	Student rarely presents themselves in a professional manner. This includes rarely communicating to staff/students with respect, and rarely keeps their work space organized and clean.
Produces Quality Work	Student always produces high quality work free from error and always strives to improve their product.	Student produces high quality work most of the time free from error and strives to improve their product most of the time.	Student occasionally produces high quality work free from error and always strives to improve their product.	Student rarely produces high quality work free from error and rarely strives to improve their product.
Respect	Always shows respect towards self, peers and teachers. Respects the classroom environment and rules.	Usually shows respect for self, peers and teachers. Mostly shows respect for rules and classroom.	Sometimes shows respect towards self, peers and teachers. Sometimes has had trouble respecting rules.	Rarely shows respect. Has needed much encouragement to show respect to self, peers, and instructor.
Cooperation	Almost always listens to, shares with, and supports the efforts of others. Tries to keep people working well together. Always cooperative.	Usually listens to, shares, with, and supports the efforts of others. Does not cause "waves" in the group. Usually cooperative.	Often listens to, shares with, and supports the efforts of others, but sometimes is not a good team member. Sometimes cooperative.	Rarely listens to, shares with, and supports the efforts of others. Often is not a good team player. Rarely cooperative. Sometimes defiant.
Demonstrates academic integrity by attending class	Present at all class meetings	Consistently attends class meetings	Meets minimum class attendance criteria	Does not meet class minimum attendance requirements
Demonstrates integrity by maintaining a professional demeanor	Always maintains professional demeanor. Demonstrates exemplary behavior with respect to rules, dress, and behavior.	Conduct is appropriate to surroundings. Displays appropriate professional demeanor.	Meets minimal standards as to demeanor and professionalism.	Displays little seriousness or purpose in demeanor. No effort to positively reflect professional attitude or disposition.
Exhibits an overall ethical demeanor	Demonstrates and exhibits the highest ethical behavior in all aspects. Personal character above reproach.	Demonstrates ethical behavior. Is honest and dependable. Displays good character.	Meets minimal expectations for maintaining an overall ethical demeanor.	Exhibits overall unethical behavior inappropriate to position. Impolite or rude.

Assessment Plan Matrix Applied to Specific Program Courses in the Industrial Technology and Management Program at Ferris State University

Outcome No. ->	1	2	3	4	5	6	7	8	9	10	11	12	13	14
APPS 301	I, R, M, P	R	I, R, P		I	I		R	I, R	I, R, P	R	I	R, P	I, R
APPS 305	R, M		R					R	R				R	
APPS 350	I, R, P	R		I	R	I	I	R	R	R			R	I, R
APPS 351	I, R, M, P	R	I, R	R, P	R	I, R, P	I	R	I, R	I, R	I, R	R	R, P	I, R
APPS 401	R, P	R, M, P	I, R	R	M, P	R	R	R	I, R	R	I, R	I, R	R	R
APPS 420	I, R, P	R		R	R	R	R	R	R	R	R	R	R	R
APPS 450	R, M	R, M, P	I, R	R, M, P	M, P	M, P	R, M, P	R	R, M	M	R	R, M, P	R	R, P
EHSM 330	R		R			R						R		
MFGE 341	I, R, M			I, R		R							R	
MFGE 352	R		R	R	R	R	I, R			R				
MFGE 423	R, P		R	R	I, R						R		R	
MGMT 301	I, R, P		R					R	I, R	I, R	I, R		R	R
MGMT 370	R		R	R		R	R	R	R	R	R	R, P	R	R
ENGL 311		I, R						R	R				R	
APPS 499	M, P	M, P	R, P	M, P	M, P	M, P	M, P	M, P	M, P	M, P	M, P	R	R	P
General Education		I, R	R					I, R	R	R	R	R	R	I, R

I = Introduce
R = Reinforce

M = Mastery
P = Program Assessment

SECTION 4: FACILITIES AND EQUIPMENT

A. Instructional Environment

The unique nature of this program enables minimum dedicated space beyond typical classrooms. The background of students in the program respects the technical expertise and previous experience in the specialty field of each individual student, as well as their contributions in the classroom with these experiences. Because of this, extensive laboratories have not been necessary in this program, aside from common computer laboratories. These laboratories are shared with other academic programs in Grand Rapids, and in the case of off-campus locations, they are shared with their respective community college.

B. Computer Access and Availability

The ITM program has adequate resources within the Grand Rapids campus at this time. Resources exist at community college partner sites, however, if a student is not enrolled in courses at the community college partner, access becomes restricted.

C. Other Instructional Technology

This does not apply to the program.

D. Library Resources

This factor does not apply directly to the program, as the program is located off-campus and students do not access the resources housed within FLITE. In virtually all cases, searches using databases to obtain full-text articles from pertinent sources have been successful. In this manner, the existing resources of FLITE have proved adequate.

SECTION 5 – PROGRAM REVIEW PANEL PERCEPTIONS

In this concluding section of the overall report, the ITM Program Review Panel offers its perceptions and conclusions to this review effort. Comments to each of the required review criteria are offered below. Ultimate conclusions will be offered after each of the specific items is addressed individually.

A. Relationship to the Mission of Ferris State University

The ITM program aligns very well with the Ferris mission. The primary reasons which support this conclusion are summarized in the points below:

- The program is highly career focused, offering the opportunity for advancement for working professionals in a blended technical and business curriculum.
- Courses offered in the evening for part time nontraditional students allow for a flexible option for students to complete the requirements of their degree, while maintaining full-time employment.
- Among the stated outcomes of the program is preparation for a number of opportunities for professional certification in order to advance the credentials of program graduates and allowing them to hold nationally recognized skill sets.
- Students in the program are established professionals, who wish to advance their careers by attaining a baccalaureate degree. The content of the program requirements allows students to obtain relevant skills and knowledge very pertinent to the needs of management professionals in an industrial or manufacturing environment.
- The program builds on the previous technical expertise of students by offering courses, knowledge and practice in topics related to the disciplines of business, engineering technology and management.
- The program is a niche program which is highly flexible for both the previous expertise and background of the students. It is not designed to compete directly with engineering programs, but offer an option for degree completion which benefits the student and their employer.

B. Program Visibility and Distinctiveness

The ITM program is still young and small compared to many programs on the Big Rapids campus, but continues to enroll students and award degrees on a consistent basis. Up until 2008, the program was offered at seven (7) off-campus sites with community college partners, offering degree completion for numerous place-bound students around the state of Michigan. The flexible nature of the program is highly attractive to prospective students, allowing for transfer of previous course work at the community college level in a large number of technical or business disciplines. A few direct competitors to this program exist both in the state of Michigan and offered via the Internet, but none of the other programs offer the degree of flexibility for nontraditional students as the ITM program. Among all 55 formal off-campus programs, the ITM program ranks 10th in total student enrollment, and is anticipated to rise from this ranking beginning in the Fall of 2009. [16]

Despite this success, it remains challenging to reach the target population of prospective students. The vast majority of prospective students are unavailable by the 'common' methods of student recruiting; high school visits and on campus at community colleges. For the short seven-year history of the program, the most successful methods of recruiting new students have been by word-of-mouth from current students, or from exposure to department web sites on the Internet. The program faculty members along with personnel from CPTS continue to attend career and higher education fairs, along with target visits within both community colleges and at larger companies that may have students interested in the program. Numerous discussions have occurred within CPTS for marketing the program effectively, and these discussions are expected to continue. Refinement of the new CPTS website is also targeted for completion in the coming months.

C. Program Value

The results of the APR surveys from various stakeholders indicate broad satisfaction with the ITM program. Current students of the program not only can complete their degrees in a cost effective manner while retaining their full time positions, they can take skills learned from the program directly to their positions while enrolled in any given course. Employers of both current students and alumni will have employees with higher levels of skill and knowledge for their positions, as well as expanded opportunities. Program alumni most times hold prestigious job titles and command salaries among the highest of all baccalaureate programs at Ferris State University. Anecdotal evidence has indicated numerous promotions of program alumni as well as current students as a direct result of the ITM program. A small number of program alumni are enrolled in graduate studies, although most alumni indicate a desire to continue their studies.

Beyond the success and satisfaction of current and former students, the Senior Project Capstone course offers direct problem solving project opportunities for employers of program students. The dollar value of executed projects has been impressive, and collectively indicates millions of dollars in total cost savings for the client firms of senior project efforts. While the client firms in each case are the direct beneficiaries of these efforts, the reputation of Ferris State University also benefits from these activities.

D. Enrollment

Student enrollment in the ITM program has grown, but inconsistently in its brief history. The highest official enrollment recorded for the program was 91 students in the Fall of 2005. For the several semesters since that time, enrollment has dropped slightly, but also appears to have stabilized on the order of 65-70 students. Many of the locations that had low enrollments were phased out as of July of 2008, leaving two locations on which focus further efforts. Both of these locations, Grand Rapids and Warren have one full time faculty member to service the needs of students and in addition, both have stable enrollment figures. For the Fall of 2009, the program appears to be poised for additional growth, and official enrollment could exceed 100 students. By publicizing the success of program students and graduates, the overall growth could continue, but the labor market conditions could also warrant a shift in direction of the program. All of these factors will be monitored in the coming years to ensure a viable program.

E. Characteristics, Quality and Employability of Students

Students typically enter the ITM program with worthwhile work experience in the manufacturing or industrial sector. An older, nontraditional student population, these individuals each wish to gain a collection of knowledge, skills and formal credentials to advance their careers. It is by capitalizing on this base of knowledge and experiences that allows the ITM program to expand the opportunities of its students. Students have proven to be highly motivated, as evidenced by fairly high grade-point-averages and attractive salaries as they finish the program. Despite the soft economy, graduates of the program continue to be in demand, as the skill sets obtained from the program remain the primary driver of the students' success. Except for a few instances, graduates of the program have enjoyed high rates of placement and steady employment. It is unknown how long the recessionary period as present will last, and whether or not this will affect the demand for program graduates. By working closely with the program Advisory Panel, as well as recent graduates of the program, faculty members will continue to monitor the market conditions in order to ready themselves and the program for any necessary adjustments.

F. Quality of Curriculum and Instruction

Based on survey results obtained from program alumni, current students, employers of alumni, and members of the program Advisory Panel, without exception, confidence in the quality of both the program curriculum and instruction is very high. Coverage in the program prepares students for a number of professional certification credentials, including Project Management Professional (PMP), Certified Quality Engineer (CQE), Industrial Technologist (CIT), and Bronze Level Lean Certification. Program faculty members, both full time and adjunct, seek relevance in the curriculum which corresponds to the needs of industrial firms. Assessment plans are in place and being executed which will offer information for pertinent adjustments in both courses and overall curriculum. Given this, the program is well positioned to continue its outstanding service to its students, their employers, and Ferris State University.

G. Composition and Quality of the Faculty

The two full-time faculty members of the ITM program are experienced professionals, bringing both industrial experience and academic teaching experience to the program. Both individuals either hold or are nearly finished with pertinent terminal degrees in technology and engineering fields. A pool of qualified adjunct faculty members supplements the instruction by bringing to the classroom expertise in a number of relevant program topics.

Full time and adjunct faculty members seek continuous improvement in teaching, as they have been active in various seminars and activities to improve teaching effectiveness. These activities are broad based and range from learning communities, training and seminars, along with educational conferences. Through the attendance of technical conferences, training sessions, professional meetings, and similar activities, faculty members strive to stay current in their respective fields. A number of assignments in service to Ferris State University allow for contributions to both the institution and the program in terms of visibility and overall credibility in pursuit of academic excellence.

Program Strengths

1. There remains a strong presence of students at multiple off-campus locations
2. There is strong interest in the program with potential students and employers of graduates of the program
3. Dedicated and qualified professionals are in place in teaching and advising capacities
4. Strong partnerships exist with members of the Advisory Panel
5. The program curriculum is flexible to meet the needs of employers and students alike
6. The program has a reputation that has gained steady momentum among students and potential employers of graduates
7. Partnerships with some community colleges are strong

Areas for Concern

Some areas of concern were identified in this report which details a number of challenges facing the program and its faculty members. In most cases, actions have been taken or are under discussion to mitigate or remove the issue. Further discussion on these matters is anticipated with CPTS administrators as needed.

Overall Conclusions

The Program Review Panel of the Industrial Technology and Management Program within the College of Professional and Technological Studies at Ferris State University has reviewed extensively the program, its curriculum and faculty members. From data collected via survey instruments offered to alumni of the program, current students, employers of alumni and members of the Advisory Panel, the results indicate high confidence in the program and its direction. The program offers an option for degree completion to those that hold an associate's degree in a technical or business related field, leading to a Bachelor of Applied Science. The interdisciplinary nature of the program allows for a flexible program which serves a wide audience of nontraditional students who are experienced in their respective workplaces. The program outcomes and goals align well with the expectations and goals of each student, their eventual employers and Ferris State University.

For the reasons stated above, the Program Review Panel recommends to:

CONTINUE THE PROGRAM

For specific items which may require additional details or clarification, the Program Review Panel welcomes further discussion with the Academic Program Review Council of the Ferris State University Academic Senate. It is anticipated the discussions which are to occur in the Fall of 2009 will be mutually beneficial.

______________________________________ ____________________

Andrew L. Purvis,
Chair, Program Review Panel
and Program Coordinator

Date

APPENDIX A-1

Original ITM Program Degree Proposal - 2001

Ferris State University
Preliminary Program Proposal Approval Form

Directions: This form should be completed using 11-point font or larger, and should be no longer than six pages (excluding the signature/comment pages). For purposes of expediting the preliminary approval process, forms may be forwarded electronically by the initiator and from one administrative level to another.

Name(s) of proposal initiator(s): **Don Green**
Department(s)/College(s): **College of Professional & Technological Studies**

Type of curriculum change (check one)

X	New degree/major
_____	New minor requiring new courses/resources
_____	New track or concentration in existing degree program
_____	Curricular customization of existing program for off-campus cohort group
_____	New certificate requiring 3 or more new courses and/or new resources
_____	Existing program redirection or shift in emphasis if 3 or more new courses and/or new resources are required

1. Name of degree, major, track, concentration, certificate, or minor. Briefly describe the curriculum plan/template.

   Bachelor of Applied Science Degree
   Manufacturing Technology, Industrial Controls Technology concentrations

2. Target date for implementation.

Summer 2002

3. Briefly explain the rationale for this initiative. If the initiative involves customization of an existing program for delivery to an off-campus cohort group, also explain the nature of the proposed curricular customization.

   The BAS degree is designed as a multi-disciplinary degree primarily for the non-traditional student who may have completed an associate's degree, has earned college credit from various sources, or desires credit through the documentation of prior learning.

   Likely participants have a technical education and desire a career change to an administrative role, sales function, or advanced technical position.

   Space for elective credits allows for customization in additional career pursuits. Advisors will guide student customization. Elective space will also serve students with large amounts of credit transfer.

   Some concentrations within the BAS will be cohort group based. Delivery method will depend on the market.

   Some concentrations may be designed around a combination of FSU certificates.

4. Are there similar programs at other Michigan universities? If so, where? What is the enrollment in the other programs?

   To our knowledge, there are no similar technical programs existing in Michigan. This program is modeled after a similar BAS degree series at Arizona State University. A Bachelor's Degree in General Business, of comparable design, at Davenport University has met with great success. FSU-GR is following up with further research on similar programs.

5. Briefly explain any similarities of the proposed initiative (program objectives and/or curriculum) with already established FSU or KCAD programs:

   The BAS is similar to the BIS as it affords customization. It differs from the BIS in three distinct ways. These are name, admission requirements, and clearly defined concentration. Integrative Studies would have less appeal to the technical student than Applied Science. The BIS requires 64 credits for admission and the BAS expects 30. Finally, while non-traditional students desire flexibility in the transfer of previously earned credits, they desire clarity in the degree's identity and content.

   Course offerings within each concentration will be a mix of currently established courses and newly developed ones.

6. Briefly describe indicators of the employment market for students completing this initiative, including sources used for employment information/data.

   Most BAS applicants will already be employed in the industry of their choice. The BAS will allow students to progress to higher levels of responsibility and pay as well as allowing them to specialize in an area of skill that may not be attainable in their current work environment.

7. Briefly describe indicators of potential student interest/demand for the new initiative, including sources used for student market information/data.

   Through advising of students we have learned that many potential bachelor's degree candidates are interested in specializing in a degree which will combine their prior college program major and their work experience. Anecdotal evidence from GRCC's provost and corporate managers supports such a degree plan. Further market research will be completed.

8. To what extent will this initiative draw new students to FSU or KCAD? To what extent will it draw students from existing programs?

   There is a large cohort of people who have a combination of undergraduate courses, apprenticeship training, corporate training courses and work experience who need a degree for professional and upward mobility. We believe that FSU-GR and UCEL can attract these industry cohorts. While flexible bachelor's degree programs have been developed for business, none have been offered locally to bring in students interested in health and technology related programs.

9. Approximately how many students are expected to enroll?

   in the first year? **30** after three years? **90**

10. At which FSU campuses/regional centers or other sites will the initiative be offered?

    FSU-GR as well as Flint, Traverse City, Muskegon, Dearborn and Detroit UCEL sites in Michigan. FSU-GR and UCEL will access other national and international sites through partnership with CMU and other organizations.

11. Will Internet or other distance learning technology be used for course/program delivery? Describe.

    Initially, no courses are internet based but as unique concentrations are developed with nationwide appeal, distribution via technology is likely.

12. Provide a rough estimate of the resources needed to implement the initiative: **Complete questions 12, 13, 14 in consultation with department head/chair and/or dean.**

	Start-up	**After Three Years**
Supply and expense	$	$
Equipment	$ **3,000**	$ **15,000**
*Full-time faculty	$ **45,000**	$ **90,000**
Overload/adjunct faculty	$ **15,000**	$ **45,000**
Other		

***Depends upon growth in any one of numerous concentrations.**

Estimate of Library Resources	_____ Adequate	__X__ Some new resources needed **(via GRCC and Web based research materials)**	_____ Significant number of resources needed

13. Project the resources that could come from reallocation within the department or college and the new resources that would be required.

    Some part time salaries would be reallocated into full time positions once growth in a specific concentration warrants full time assignments. FSU-GR or UCEL will provide funds for marketing, equipment, support staff and materials.

14. Are there new space needs? If so, how much? How would the space be used? Has existing space been identified? If so, where? Is renovation/remodeling necessary?

    No new space needs for now.

15. Is there professional accreditation for the program? Is it required or voluntary? Will accreditation be sought, and when? What will be the one-time and ongoing costs of accreditation?

    None

16. Has there been preliminary discussion with other departments/colleges that will be involved in course/program delivery? If yes, what was the feedback?

    Discussion with Oliver Evans and Max Shangle for Wood Manufacturing degree. They are both fully supportive.

    Further discussions will continue with various Department Heads and Deans.

Page 4. Preliminary Program Approval Form

Department Head/Chair's signature______________________________ Date__________

If this is an interdepartmental initiative, include additional Department Head/Chair signatures

Comments:

Dean's or KCAD President's signature_ ______________________________Date_______

- For cross-college initiatives, include additional signature(s) of Dean(s)
- For KCAD initiatives, include KCAD President's signature
- For existing FSU-Big Rapids programs customized for off-campus delivery to a cohort group, include College and UCEL Deans' signatures

Comments:

Signed by Don Green, FSU/GR Dean of the College of Professional and Technological Studies on 9/4/01

Vice President for Academic Affairs' signature _________________________Date_______
or Chancellor/VP of FSU/GR's signature

XXX Approved Approval indicates permission to develop the full proposal. It does not assure final approval.

Comments and/or suggestions:

Signed and approved by Ken Schultz, FSU/GR Chancellor and VP on 9/04/01

_______Not approved

Explanation:

c. Initiator(s)
Department Head/Chair(s)
Deans' Council and KCAD President
FSU University Curriculum Council
FSU Academic Senate and KCAD Senate
VPAA or Chancellor/VP of FSU/GR
FSU Intranet

APPENDIX A-2

Modified ITM Program Degree Proposal - 2002

PROPOSAL FOR APPROVAL OF THE

BACHELOR OF APPLIED SCIENCE DEGREE AND THE

CONCENTRATION IN INDUSTRIAL TECHNOLOGY AND MANAGEMENT

FOR

FERRIS STATE UNIVERSITY-GRAND RAPIDS

Request for Approval Submitted by

Donald J. Green, Ed.D.

Vice Chancellor and Dean,

College of Professional and Technological Studies

TABLE OF CONTENTS

Proposed Degree and Concentration Information

General Description

The Bachelor of Applied Science (BAS) degree is designed as a multi-disciplinary degree intended primarily for the non-traditional student who may have completed an associate's degree, has earned college credit from various sources, or desires credit through the documentation of prior learning.
Likely participants have a technical education and desire a career change to an administrative role, sales function, or advanced technical position.

The degree will include a concentration, core, general education, and electives. Initially, one concentration is being proposed with the degree. This concentration is Industrial Technology and Management. Additional concentrations are likely and could be developed from one or more certificates currently offered in the University.

The BAS is designed to offer flexibility due to significant space for elective credits. This flexibility allows three advantages. Students with large amounts of transferable credit will find relative ease in transferring credit into the BAS. Secondly, this flexibility allows for the customization of additional course work to serve the student's individual career pursuits. CPTS in cooperation with appropriate colleges will find advisors to guide student customization. Since this degree may be offered to industry cohorts, these small industry-based groups may have a set of courses generalized to the needs of the company or industry. The additional space in this degree will allow for sponsoring organizations to bring customization to the degree.

Admission Requirements
Minimum credits for admission into the BAS Degree Program will require at least 30 credits. In certain circumstances individuals may be admitted into the program without prior earned credit due to the possession of prior experience or certifications that may lead to credit for prior learning. In addition, students may be enrolled concurrently at FSU-GR and Grand Rapids Community College. Admission with less than 30 credits will be by permission of the Dean, College of Professional and Technological Studies. A 2.5 overall GPA and 2.5 in mathematics courses is required for admission. All official college transcripts must be submitted at time of admission. To be considered for financial aid from Ferris, students must have earned an associate's degree or 62 transferable semester hours or take at least six credit hours from FSU each semester.

Graduation Requirements

The BAS degree, with a specific concentration, will be awarded by the College of Professional and Technological Studies. A minimum of 124 semester hours must be completed to earn the BAS degree. Forty credit hours of the degree must be at a course level of 300 or above. A minimum of 36 credits must be completed within the Career Requirements (the combination of the Core and Career Requirements). A minimum of 30 semester hours of FSU coursework must be completed to fulfill residency requirements.

Program Requirements

Career Requirements

- Career requirements encompass the Core Requirements and Concentration.
- The BAS degree's career requirements involve a minimum of 36 total credits.

Core Requirements

- Minimum 12 semester hours
- Courses will be at the 300/400 level
- Requires a minimum of one, three credit hour course at the 300/400 level in each of the following three general categories.
  Business/management
  Professional communication
  Professional computer competency related to area of concentration
- The senior level capstone course requirement will be fulfilled within the core requirements.

Concentration

- Courses will be at the 300/400 level
- With the assistance of an advisor, the student will select a pre-planned concentration.
- Concentrations may be made up of multiple FSU certificates.

General Education Requirements

- Students must fulfill FSU general education requirements for a Bachelor's degree. Community College MACRAO agreements will be honored.

Elective Requirements

- 48 - 50 semester hours
- May include transfer credits, prerequisite hours, hours that support the concentration or credits earned via the assessment of prior learning (APL) process. Credit may also be earned through course proficiency exams, CLEP or DANTES tests.

Student Advising

Admitted students will be advised by a curriculum faculty through the College of Professional and Technological Studies or from other related colleges on the main campus. When necessary CPTS will offer training to advisors in the distinction in the BAS and its concentration. As new concentrations are offered, additional faculty may need to be hired and trained to instruct and advise.

Career Preparation

Bachelor of Applied Science offerings are designed for working adults who are part-time students and will allow individuals to develop a concentration of expertise in a specific discipline. In addition, the core for the BAS will offer course work in organizational management, computer applications, professional communications, and project management.

Through this degree design, the BAS will allow students to progress to higher positions within their organization as well as allowing them to specialize in an area of skill that may not be attainable in their current work environment. Likely participants will possess a technical education and desire a career change to a managerial role, sales function, or advanced technical position. Most BAS applicants will already be employed in the industry of their choice so the degree's design emphasizes career advancement rather than career exploration.

Specific careers for BAS graduates with the Industrial Technology and Management Concentration would include:

- Production Supervisor or Manager
- Sales Engineer
- Production Control Planner
- Quality Supervisor or Manager
- Engineering Supervisor or Manager
- Program or Project Manager

Job Outlook for Degree Recipients

Recipients of the BAS will find a manufacturing labor market demanding their talents. Many manufacturing organizations require the possession of a bachelor's degree for middle management positions. These same organizations struggle to find technically competent people who can be promoted. Individuals attaining this degree will possess valuable work experience, previous training or education in a technical field, and a degree that offers further technical competence and management development. Opportunities for advancement are excellent.

Program Check Sheet (Form D) – see Appendix A

Expected Implementation Date
The Bachelor of Applied Science with the concentration in Industrial Technology and Management will be implemented Summer, 2002.

Additional concentrations will be introduced according to customer demand.

Accreditation
There is no formal accreditation for this program.

Articulation
The Bachelor of Applied Science was developed specifically for easy articulation of associate degree programs. The degree was designed in cooperation with Grand Rapids Community College to serve students in easy transfer of credit (see attached letter of support from GRCC's Provost – **Appendix B**).

Need for the Proposed Degree/Program

Offerings by Neighboring Institutions
The Bachelor of Applied Science degree is offered at one public institution in the State of Michigan. The University of Michigan – Flint BAS is available to students who desire completion of a bachelor's degree and have "education and experience in a technical field." Students completing the Bachelors of Applied Science from U of M – Flint major in Applied Science. This "program leads to a baccalaureate degree for graduates of two-year programs in specified technical areas. The degree permits a student who has had education and experience in a technical field to transfer these credits … and complete a baccalaureate degree in a program appropriate to the student's interests and needs." The degree awards a concentration in Applied Science with flexibility to study other career pursuits. The primary difference in the U of M – Flint degree and the FSU – GR degree will be the specificity of concentrations. FSU-GR plans to offer a variety of concentrations within the BAS while U of M – Flint offers one generalized major in applied science.

Two private colleges in Michigan offer the Bachelor of Applied Science. Davenport University offers the Bachelor of Applied Science in Business. The BAS was designed to accommodate large numbers of transfer credit and to offer flexibility for non-traditional students.

Marygrove College offers the BAS in two majors, Allied Health and Computer Information Systems. The Allied Health major is designed for transfer from Associate of Applied Science Degrees in Allied Health or Nursing.
Marygrove offers both a BS and BAS in Computer Information Systems. Differences on the two degree programs were not forthcoming from Marygrove.

Identified Differences
While the College of Professional and Technological Studies cannot rule out the possibility that a curriculum in health sciences, business, or computer information

systems might someday be offered as a concentration in the BAS, current concentrations within the degree will be related to technologies surrounding manufacturing.

The BAS being proposed is designed to specifically target the adult market. The University of Michigan – Flint has designed a BAS with a similar intent. The primary difference in the U of M – Flint degree and the FSU – GR degree will be the specificity of concentrations. FSU-GR plans to offer a variety of concentrations within the BAS while U of M – Flint offers one generalized major.

Relationship to Current University Programs

Closely Related Curricula Within the University

The Bachelor of Applied Science degree is unlike any other degree program at Ferris State University. Its design serves the non-traditional student through convenient credit transfer and serves to help working adults progress in their careers.

Initially, the Concentration in Industrial Technology and Management appears similar to the Bachelor of Science Degree in Manufacturing Engineering Technology. Further scrutiny shows the BS in Manufacturing Engineering Technology offers more in-depth study of processes (e.g. Plastics Processes, Tool Engineering, Metrology, and Statics and Strength of Materials). The BAS, with a Concentration in Industrial Technology and Management, emphasizes the work of various departments within a manufacturing organization and the overall management of that organization (e.g. Industrial Engineering, Facilities Planning, Quality Science, and Project Management). Duplicated enrollments for the Manufacturing Engineering Technology program for FSU-GR for the last three years follow in **Table 1**.

Table 1
Duplicated Enrollments in Manufacturing Engineering Technology, B.S. for FSU-GR.

Academic Year	Enrollment
1998-1999	217
1999-2000	222
2000-2001	229

The BAS in Industrial Technology and Management has been designed to share a number of the MET courses. It is expected that the BAS in Industrial Technology and Management will enhance the enrollments by section in these shared courses, offering greater revenue enhancement for the University. The College for Professional and Technological Studies intends to make a strong marketing effort to local industry for both programs.

The curriculum consultation form is intended to offer the opportunity for analysis and feedback from College's affected by the proposed degree. Comments by the College of Technology and responses by CPTS, based on the questions of the curriculum consultation form, can be found in **Appendix C**.

Impact of Proposed Degree on Current Degrees
The BAS is designed to serve the purposes of the non-traditional student who is currently employed. This student desires very specific degree content that will allow for a breadth of technical knowledge and the ability to progress into management positions within his or her current organization. This student should be a different market niche and should not affect enrollments in the College of Technology. The concentration in Industrial Technology and Management will use existing courses through the College of Technology.

Appropriateness of Current Degrees in Meeting Objectives
As mentioned, the BAS curriculum is designed to meet the career growth needs of currently employed individuals. In addition, the degree is designed to allow for transfer credit from a number of previous endeavors. Current degree offerings are designed to better serve the needs of a traditional student.

Curriculum Consultation Form (Form B) – see Appendix D

Market Demand Research

Number of Students in First , Third and Fifth Years

The future demand for those with higher education qualifications will be shaped by the changing structure of the national economy and the labor market, which in turn will be responding to changes in the world economy and the associated competitive challenges. These forces will find their response in the choices made by individuals about participation in higher education and in employer demand for lifelong learning opportunities on behalf of their employees.

Graduates are now being employed in jobs, which were traditionally held by non-graduates. Today, employers routinely tie degree requirements to promotion. Likely participants have a technical education and desire a career change to an administrative role, sales function, or advanced technical position.

CPTS plans to aggressively market the BAS and Industrial Technology and Management Concentration to local companies. In addition to marketing through companies, CPTS will advertise directly to individuals that received an Associates Degree and then went directly into the job market. It will be promoted alongside the B.S. Degrees in Manufacturing Engineering Technology and Quality Engineering Technology.

The BAS is designed to offer flexibility due to significant space for elective credits. This flexibility will allow students with large amounts of transferable credit relative ease in transferring credit into the BAS and for the customization of additional course work to serve the student's individual career pursuits.

Because of the advantages detailed above, CPTS estimates the number of majors for the first year to be approximately 25 students, 90 students for the third and 120 for the fifth year.

Number of Graduates in Third and Fifth Years

The BAS degree is designed for the non-traditional student who is employed and only able to take courses on a part-time basis. CPTS students face career and life demands which cause sporadic enrollments. With this in mind, we estimate the number of graduates in the third year to be two to five with approximately 10-15 graduates in the fifth year.

Methodology for Developing Estimates

Estimates were based on initial enrollment in other programs begun in Grand Rapids including MET and Criminal Justice, results from a local employer survey (see **Appendix E**), and the uniqueness of this degree and concentration.

Associate Degree and Certificate Majors for Laddered Programs

The Bachelor of Applied Science was developed specifically for easy articulation of associate degree programs. The degree was designed in cooperation with Grand Rapids Community College to serve students in ease of transfer. The feeder programs from GRCC are AAS degrees in Technology, Tooling and Manufacturing, and Welding along with certificate programs in Quality Science and Plastics Manufacturing Technology. Enrollment and graduation data for the various feed associate degrees are listed in **Tables 2 and 3**. Enrollment in these manufacturing based programs has been lower in recent years due to economic growth and subsequent demand in the labor market.

Number of Declared Students in Anticipated Feeder Programs

Table 2
Enrollments in Selected Programs 1998-99 through 2000-01

Academic Plan	Academic Year		
	98-99	**99-00**	**00-01**
Technology Option-900	109	116	85
Tooling & Mfg Tech-908	106	74	86
Welding Technology-932	26	18	16
Quality Science, Cert-940	16	20	17
Plastics Mfg Tech, Cert-945	0	1	3
Grand Total	257	229	207

Students Awarded Degrees in Anticipated Feeder Programs

Table 3
Graduates in Selected Programs 1998-99 through 2000-01

Academic Plan	Academic Year		
	98-99	**99-00**	**00-01**
Technology Option-900	26	26	20
Tooling & Mfg Tech-908	2	5	6
Welding Technology-932	4	1	1
Quality Science, Cert-940	1	2	2
Plastics Mfg Tech, Cert-945	0	0	0
Grand Total	33	34	29

Existing/Additional Support and Resources

Faculty Resources
If faculty are available from the College of Technology, they will be given the opportunity to teach appropriate courses in the concentration in Industrial Technology and Management. It is understood that with future growth in this concentration, the CPTS will collaborate with the College of Technology to fulfill faculty resource needs.

Facilities Resources
Facilities will change little for the proposed degree and concentration. No extraordinary demands are expected from the introduction of the Industrial Technology and Management Concentration.

Library Resources
Library resource requirements will change little since, other than APPS 499 (The Program Capstone Course), no new courses have been developed. Content within the degree program will come from the content of various existing programs such as Manufacturing Engineering Technology, Electrical/Electronic Engineering Technology, Industrial Electronics Technology and Business Management. Because the courses in the BAS are offered in Grand Rapids, a Library consultation form was not completed. APPS 499 is patterned after similar capstone courses at FSU.

Budget Implications of Curriculum Changes

	Year 1	Year 3
Revenue:		
Tuition*	$46,125	$182,250
Expenses:		
Instructional/Advising	$13,280	$32,930
Marketing/Promotion	20,000	40,000
Equipment/Software/Lab Facilities	5,000	10,000
Incentive Payback to Colleges and Departments	6,470	19,405
Total Expenses	$44,750	$102,335
Net Revenue	$1,375	$79,915

*$205/credit for Year 1 and $225/credit for Year 3, 9 credits per student per academic year.

End-of-Program Outcomes and Outcomes Assessment Plan

Program Name
Concentration in Industrial Technology and Management, Bachelor of Applied Science

Responsibilities and Timeline
Short-term Component (One Year):

- Advisory Committee Formalized
- Faculty Advisors Trained
- Adjunct Faculty Evaluation Administered
- Student Representative Feedback Sessions
- Exit Interviews

Mid-term Component (Two Years):
- Ongoing Advisory Committee Meetings
- Faculty Feedback Sessions
- Student Representative Feedback Sessions
- Curriculum Review and Revision
- Exit Interviews

Long-term Component (Three – Five Years):
- Ongoing Advisory Committee Meetings
- Ongoing Faculty Feedback Sessions
- Ongoing Student Representative Feedback Sessions
- Graduate Surveys
- Employer Surveys
- Curriculum Review as Necessary

Program Outcomes
Graduates will be able to:
- analyze production and plant lay-out for greater efficiencies.
- apply management concepts within an industrial environment.
- understand the role and responsibilities of a quality department and its contribution to the organization.
- use technology and design as tools in solving manufacturing problems.
- seek promotion opportunities in manufacturing, engineering or sales within an industrial environment.

Program Assessment Tools
Learning Assessment Tools
- Written Tests
- Case Studies, Designs and Proposals
- Individual Presentations
- Team Projects and Presentations
- Capstone Course

Course Assessment Tools
- Faculty Feedback Sessions
- Student Representative Feedback Sessions
- Exit Interviews

Concentration Assessment Tools
- Student Representative Feedback Sessions
- Advisory Committee Meetings
- Exit Interviews
- Graduate Surveys
- Employer Surveys
- Program Review
- Capstone Course

Distribution of Results
Results of surveys collected on behalf of the Bachelor of Applied Science program or the Concentration in Industrial Technology and Management will be distributed to faculty and Colleges associated with the program. In addition, results will be shared with members of the program's advisory committee.

Use of Results
Faculty associated with the College of Professional and Technological Studies or faculty from participating Colleges involved in the Concentration in Industrial Technology and Management will be asked to participate in curriculum revisions based on the results of program assessment. Program assessment results will also be used to develop reports and presentations for the program review process.

Future Program Planning
Program results will be used in the development of new programs, instructional methods including distance learning, and faculty development.

Proposal Summary

As Ferris State University seeks to compete in the adult student market, academic products will need to be created which offer flexibility and transferability. The BAS with a concentration in Industrial Technology and Management offers an opportunity to actively compete in this adult market. With the proposed design, the BAS serves a unique market niche efficiently without detracting from other Ferris State University programs.

APPENDIX A-3

Examples of Two Final Reports from APPS 499 – Senior Project Capstone

Combined Case Cell Kaizen Event

By xxxxxxxxx

Advisor: Andrew Purvis

Applied Science Capstone

Ferris State University

APPS 499 AGA – Spring 2009

TABLE OF CONTENTS   Page Number

EXECUTIVE SUMMARY

In the current competitive market of aerospace suppliers Brothers Aerospace Propulsion Systems (BAPS) cannot afford to be wasteful in any aspect of its business model. During an examination of all processes it was found that there were two separate manufacturing cells that could be combined because these cells were running parts from the same product family. The primary difference was that one cell focused on the larger size cases and the other cell on the small and medium size cases. The result of this duplication was waste that needed to be eliminated in order to be a greater benefit to the business. Wastes that were examined during the execution of this event were:

- Duplication of equipment
- Lack of flow
- Excess man hours

Not only was waste a concern but customers have indicated a desire to contract for more parts to be repaired but it was known that before this could happen throughput needed to be increased by at least 30%.

Because of the waste that was created by having these two cells the decision was made to hold a Kaizen event for the purpose of combining the cells into one effective cell. The goal was that by the end of the event there would be one cell which consumed less floor space and had an improved flow. In addition to increasing throughput, floor space needed to be reduced by 25%. Waste within the processes had to be eliminated and labor hours were to be reduced. It was expected that once this effort was complete, customer satisfaction would be increased and profit margins improved.

To conduct this event a cross-functional team was formed including Sr. Management, Engineering, Supervision, and Operators. Prior to the live event some data collection was completed in order to conduct the event with greater expediency. During the event the data drove the decisions that were made. Using data and brainstorming a design was created that accomplished the goal of combining the two cells into one and greatly reducing the waste that was built into the resultant processes.

The outcome of this event was the realization of savings in many areas. Overall floor space consumed by these processes was reduced by 50% while lead time and total cycle time were each reduced by more than 60%. The most significant changes were made to the quantity of work in process (WIP) and to the part travel distance. WIP was reduced by 71% and part travel distance was reduced by 82%. This event was also a success in the reduction of manpower by 8 people for a 35% reduction of the total manpower required. While there were a few things left undone due to budgetary or time constraints this event was deemed a success because the goals that were set forth were either met or exceeded. The contribution of the new cell to the overall success of Brothers Aerospace Propulsion Systems is more significant now that it is leaner and better equipped to meet the ever changing challenges in the aerospace industry.

EQUIPMENT LIST

The following is a list of equipment, and resources that was used in conducting the case cell Kaizen.

Measuring wheel

Conference room to use as “war room”

Plant drawings

Fork lift

Scissor lift

Large rolls of paper

Pads of paper

Pens, pencils, markers

Post-it notes

Blue 1 inch masking tape

INTRODUCTION

At Brothers Aerospace Propulsion Systems (BAPS), two separate manufacturing cells were charged with tasks relating to parts from the same product family. Each cell conducted the overhaul and repair (O&R) as well as original equipment manufacturer (OEM) of parts as customer demand dictated. The primary difference was that one cell focused on the larger size cases and the other cell on the small and medium size cases. The Large Case Cell (LCC) and the Small Case Cell (SCC) each had equipment designed to facilitate the manufacture of their respective products. Having two cells however resulted in a duplication of machinery in order for each cell to accomplish its assigned tasks. The result of this duplication was waste that needed to be eliminated in order to be a greater benefit to the business. A Kaizen event was chosen as the tool that would be used to target and eliminate waste. A Kaizen event is a team event dedicated to quick implementation of a lean manufacturing method in a particular area over a short time period. **(Tapping, Luyster, Shuker 2002)** Wastes that were to be examined during the execution of this event were:

- Duplication of equipment
- Lack of flow
- Excess man hours

Since the LCC and SCC were set up as separate entities to accomplish similar tasks, there was the unintended result of having duplicate equipment. In some cases, due to the size or cost of equipment there were some shared resources located outside of either cell. Consequently, operators and parts were required to travel greater distances to accomplish the tasks necessary to the overall processing of these components. Extra equipment also resulted in greater electricity consumption, a greater demand for floor space, and capital that could be better allocated to other areas of the business. Not only did combining these two cells allow BAPS to reduce the occurrence of duplicated equipment but it also allowed the facility to improve the flow of parts through the cell.

Another of the goals in this project was to implement a system of one piece flow and by combining two cells into one it laid the ground work to achieve this goal. By utilizing the data that was collected the new cell was assembled and arranged with right sized equipment. This improvement facilitated a one piece flow reducing the outflows and backflows. Because the part travel was not automated, time for an operator to move the part was required; therefore, any reduction in part travel was also expected to result in a reduction in labor hours.

Having inefficiencies built into the process translated to inefficiencies in labor utilization. Operating in an industry demanding lower costs while increasing demand of product, it became all the more important to properly utilize every hour of available labor. The team was confident that by combining cells and implementing one piece flow with a good value stream that overall labor to build these parts would be reduced. This then resulted in the ability to re-allocate some workers into other areas of the business that were experiencing a greater demand on labor hours.

The aforementioned goals highlighted items that were specific to building product and delighting the customer. However, there are other benefits that were achieved through the completion of this event. Safety is always a priority and by redesigning the cells, it was possible to design in safety and ergonomics creating a better environment in which to work. Also, since there is continuing effort to increase output with fewer resources this project allowed the movement of labor pools that were utilized in other areas. Finally, by reducing throughput time, additional production time was made available in order to acquire new work either from existing customers or from new customers.

LITERATURE SEARCH

Muda is a Japanese word for waste. Taiichi Ohno defined waste in manufacturing as follows: overproduction, waiting, unnecessary transport, unnecessary or in-correct processing, excess inventory, unnecessary movement, and defects. **(Liker 2004)** Ohno considered the fundamental waste to be overproduction because from that stems most of the other wastes. **(Liker 2004)** In the case of this project the overproduction was found in having two cells that accomplished essentially the same function. As a result of this overproduction the remainder of the wastes were found within the two cells and that is why this team proposed combining and optimizing them.

In this study, the team began by conducting a product – quantity (P-Q) analysis. The P-Q analysis logged the parts that were manufactured in each cell along with the quantity of each part being manufactured. The data that was collected was inserted into a Pareto chart. The goal for this exercise was to determine which parts would comprise 80% of the demand on the cell. This information also became very useful when conducting the load balancing because as equipment and skills needs were analyzed, the primary focus of the cell became clear. It was determined that if a product in the minority category required equipment not available within the cell it may not be prudent to add it to the cell.

Takt times were also calculated early on because they were needed for many of the other aspects required to complete this project. In the term takt time calculation *Takt* is a German word that can be loosely translated as "beat" or conductors baton. **(Tapping, Luyster, Shuker 2002)** Takt time is the rate at which something needs to be finished in order to meet customer demand. For the processes within the cells which involved cycle times the existing cycle times were captured in the capacity model. Then, when the data was analyzed, the cycle times were compared with existing service level agreements (SLAs). **(Roy 2000)** Wherever a mismatch exceeded the takt time, improvements were made to match the cycle time with the takt time for the system. The total pre-kaizen takt times for these two cells was 299 minutes and it was felt that the estimate of a 50% reduction in takt time was feasible even while reducing overall manpower by five operators.

The ideal state for producing in a cellular environment is to have a balanced line. Ideally, all operators assigned to the cell will be performing the same amount of work and executing tasks according to the TAKT time. This is accomplished by smoothing the variations that are inherent to the manufacturing process for a given family of parts. By balancing the line no operator will be overburdened or waiting and everyone will be working together in a balanced fashion. **(Tapping, Luyster, Shuker 2002)**

Load Balancing was an important step that the team undertook to begin proving its hypothesis. The application of the load balance helped determine some unique features about the processes within each cell. It was important to understand how much time each part spent at each operation in order to optimize the flow. **(Liker, Meijer 2006)** It was anticipated that specific pieces of equipment could be re-allocated and also additional equipment may need to be procured. Understanding the equipment needs helped in the design of the optimal cell layout.

The flow diagram was used to map the travel of each part through the plant. The complete path of the parts was laid out on a drawing of the plant clearly defining the route of each part. The route from receiving to production and eventually to shipping was carefully documented to create the flow diagram. The flow diagram pointed out problems with factors such as cross traffic, backflows, and total distance traveled. **(Meyer, Stephens 2006**) It was believed that combining the two cells could achieve a reduction in operator and part travel a minimum of 40%. It was also desired to eliminate the need for the operators and parts to travel outside of the cell to which they are assigned. The data showed that a reduction of 80% part travel could be achieved so that the operators would have to travel no more than 1000 feet during the process as opposed to the existing 5900 feet being traveled before this project began.

Cross traffic and back tracking were issues that needed resolution to solve a few problems. One problem was that both issues cause congestion and inefficient flow. Cross traffic was also a safety concern because collisions can occur at points where traffic crosses another path. Since two of the goals of this project were to improve safety and create better flow, the flow diagram was a vital part of accomplishing these goals. Travel distance was a major consideration because it required both time and effort, and hence, additional cost to the component. **(Meyer, Stephens 2006)** The flow diagram that was created mapped the flow and indicated the distances traveled. By coupling the distance factor with the travel path of parts on the same layout, it made it possible to not only optimize the travel of parts but also to fully minimize the travel distance thereby saving money.

EVALUATION OF ALTERNATIVES

As this project took shape, the team noticed that the ideas that were brought to the table initially were not all being implemented. A project such as this requires keeping an open mind with no pre-conceived ideas and no limitations. Even though this is a widely held requirement most team members still come with a final plan already in mind. Going through this event in a standardized manner has allowed the entire team to see that a different way might be a better way. It was this thinking that inspired some on the team to get creative and come up with alternative solutions.

Since the beginning of the lean journey at BAPS the idea of a work cell has been seen as a “U” shaped cell and no other variation is possible. This is one of the ideas that most team members had envisioned at the beginning of this event. The resultant issue in this case was that once data was collected and layouts were considered, it became difficult to fit the design into the traditional “U” shaped cell.

As the line balancing data collection got underway, it became apparent that there would be some equipment that would not be practical to place within the confines of a “U” shaped cell. This then left the team realizing that it would not be practical to eliminate all outflows. It was with this realization that some of the pre-conceived ideas began to be left behind as the new question became how to implement one piece flow in a single cell while still reducing the overall footprint. Suddenly the ideas that began to surface were many and the team had to create a set of criteria in order to evaluate the various ideas that came to the forefront.

Viewing the initial goals of this project was an obvious place to start for creating the criteria but with the details of this cell beginning to take shape, more detail than just the goals was needed as criteria for selection of the appropriate alternative. Table I shows the criteria that were developed using a weighted multiplier. The list is sorted from top down from the most important to the least important.

Table I Weighted multiplier determining priority of criteria

Factors	Cost	Image	Throughput	Model cell	Decrease inventory	Morale	Total
Weights	3	3	4	3	4	2	
Encourage one piece flow	8	12	16	9	16	4	65
Drive improved on time delivery	6	12	16	12	12	6	64
Visual tracking of work in progress	4	9	16	6	16	6	57
Should employ ideas new to BAPS	8	6	12	9	12	8	55
Reduce quality problems	8	9	12	12	8	6	55
Decrease in floor space	12	6	12	6	16	2	54
Technologically advanced	4	3	12	12	12	6	49
Design should be functional as defined by operators	6	6	8	9	8	8	45
Improve safety – especially ergonomics	8	9	4	12	4	8	45
Sustainable – both for energy as well as theory	4	12	8	12	4	4	44

With the selection criteria defined it was much easier to evaluate the many ideas for the design of this cell that were presented. Overall there were 18 ideas that were considered and measured against these criteria. Four were a form of the traditional “U” shaped cell. Three were ideas that did not combine the two cells into one and while there were good arguments for this, they still did not address many of the team’s goals. Eight ideas were fresh and different from anything that has been used at BAPS since the start of its lean journey. The other eleven ideas were simply slight variations of the above mentioned ideas. After evaluating each design to the selection criteria it became possible to settle on one design from which to work as a base. The design that was chosen ultimately had a main line, or aisle, with two feeder lines.

The first feeder line is where the parts arrive for initial evaluation and machining. From there the parts are transferred to the main line where the bulk of the operations are performed. Because there is still the need for some outflows though, the parts travel to the other resources and then back into the second feeder line. Here the remainder of the work takes place except for some final painting and curing operations. The part then goes to final inspection and then on to shipping. Once the team had a basic layout on which to build, more detailed design work took place to achieve the goals that were set at the beginning of the project.

DISCUSSION AND ANALYSIS

Over the past two years growth of product lines through increased customer demand and improved capabilities has constrained available space for existing manufacturing and further expansion of product lines. After reviewing the five and ten year plans for the business it has become apparent that more space will be necessary to meet these anticipated needs. The search for more floor space turned up an unexpected result in that BAPS is not operating as efficiently as it could be. Amongst the findings was the fact that there were cells operating independently that could be combined to operate as a single entity. As a result, product flows were inefficient and manpower was being wasted.

Combining two cells into one became a priority as floor space for manufacturing has slowly dwindled at BAPS. Other methods for gaining floor space have been explored such as expanding the existing buildings, buying a new building, or joining two existing buildings. It was determined that it is important to be as efficient as possible before laying out the large capital expenditure required to increase floor space through building additions. As a consequence the decision was made to explore combining the two case cells into one using a Kaizen event.

Accomplishing an event such as this is performed typically through the use of a standardized work process. This template allows for creativity to be maximized without having to first determine what needs to be done and how to do it. For the Kaizen work instruction see figure A-I in Appendix A. Accompanying each work instruction is a breakdown of each tool employed and instructions concerning the operation of each tool. The goal with this level of detail is to have a different cross-functional team any time an event such as this is held without having to conduct in depth training in each case. The instructions make it possible for anyone to come in and be a productive member of an event team.

The mission statement created for this event was a brief statement that expressed the problem and the goal as one statement. The mission statement for this event follows:

"Implement a functional and sustainable cell using technology and new ideas providing for 1-piece flow based on optimized product groups that allows for visual WIP tracking."

Implement a functional and sustainable cell implied that input from the operators would help facilitate a better and more efficient work environment. Technology and new ideas aided in making this cell stand out from the rest and be ergonomic and simple. An improvement in flow and combining of the cells was defined with the one piece flow and optimized product groups. With a solid mission statement on paper the team had a clear understanding where this project was to lead.

Before any equipment moved or anything changed, it was crucial to collect data. Past experience has shown it is through data that effective and sustainable changes are made in order to accomplish the goals and tasks in the mission statement. As a company it was already known that inefficiencies existed but in order for the team to accomplish its goals it was important to know where the inefficiencies existed and to what extent the inefficiencies were present. For a map of the current state please see figure A-II in Appendix A. Collecting data for these two cells showed the team the current state of the two cells and the trends that needed to be adjusted in designing the future of the single cell. The data that was collected is the P-Q analysis, TAKT time calculation, manpower loading, machine loading, and flow diagram. From this data the team created a capacity model showing where the inefficiencies existed in the current cells. All of this data was also used in the creation of the new cell to determine what the physical aspects of the cell would be. Detailing all this data not only helped the team determine what the capacity of the cell would be, but will also allow for quick adjustments as product mix and demand changes in the future.

The product-quantity analysis, or P-Q analysis, was one of the first and most important data sets to start collecting because it helped the team separate the critical few from the trivial many in terms of parts produced. This chart showed the total quantity of products distributed among different product types, with the assumption that higher volume products would be the first to be targeted in the design of the new cell. **(Tapping, Luyster, Shuker 2002)** This analysis helped determine some key factors about the product being produced in each of the two cells. Factor 1 indicated the part number for each part and factor 2 the quantity of each part. Another important factor was the cumulative total of parts because the team was primarily focused on the top 80% of parts; the critical few. This is not to say the other 20% were ignored but because these parts only made up 20% of the volume, it was not practical to focus exorbitant amounts of capital or floor space on these specific lower volume parts. History has also shown that when a cell is properly designed for the 80% the 20% can still be run through that cell but may have some minimal outflows or backflows.

The team performed the P-Q analysis following four basic steps.

1. Obtain 3 – 6 months of data on production output
2. Enter products by quantity on a P-Q analysis list
3. Create a Pareto chart using the data from the list
4. Analyze the product mix

This analysis showed that of the 26 parts that made up the volume of the two cells, nine comprised the top 80% as shown in figure I below. By conducting the analysis the team knew where to focus energy for the rest of the project.

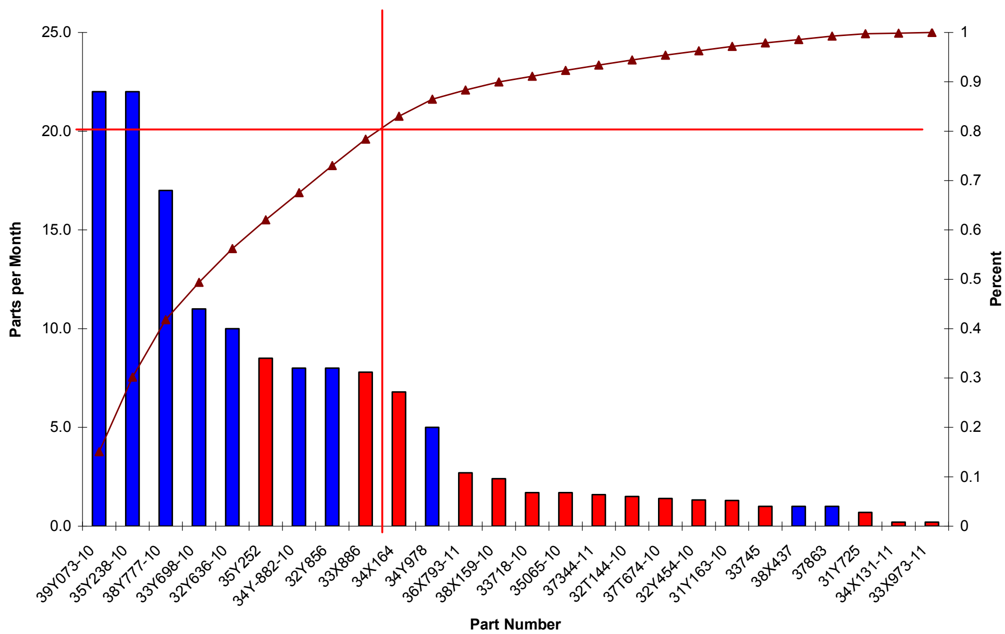

Figure I Pareto of product – quantity analysis showing parts comprising top 80%

Takt time was important to this event because takt time is the drumbeat that directs the rest of the activities. Takt time and cycle time should not be confused however. Takt time is the available production time to make a part while cycle time is the time it takes to complete one operation in a process. Knowing the takt time will gave the team the starting point for balancing the line so that cycle time would not exceed the takt time.

To calculate the takt time the team first had to understand the ordering patterns for the customers the new cell will service. By investigating data such as sales forecasts, previous six months actual production, and long term agreements the team was able to determine how many parts would be moving through the cell. This information was then used with the following calculation:

$$\text{Takt time} = \frac{\text{Available production time}}{\text{Total daily quantity required}}$$

What the team discovered is that in the SCC there is a demand for 94 parts per month. After calculating the total available work time to be 10,716 minutes per month that number was then divided by the 94 expected parts. This resulted in a takt time of 114 minutes per part. This process was then completed for the LCC with a parts quantity of

58 pieces per month. This resulted in a takt time of 185 minutes per part. The complete takt time calculation can be reviewed in figure A-III of Appendix A.

Now that the product/quantity mix is known and the takt time has been calculated the next step was to level the production to a point that could be managed without having to react to the constantly fluctuating order levels. Loosely translated, Heijunka means to level or to make smooth. In typical lean references the meaning is to level the product mix over a specific period of time. **(Liker, Meier 2006)** Because of the wide swing in customer demand this is accomplished through a higher level of inventory that can be drawn from during periods of higher demand. Another meaning of Heijunka however is a self imposed leveling for the internal benefit of the value stream. **(Liker, Meier 2006)** Conducting this activity was beneficial to the new cell because it allowed it to achieve a certain level of internal balance. To conduct the balancing activity, data was collected for several entities within the value stream.

Manpower loading and machine loading were conducted using a standard work combination sheet. For an example of a completed standard work combination sheet see table A-I of Appendix A. One sheet was used to determine the quantity of machine time used for each process and the other sheet was used to determine how much labor time was being consumed at each process. This task required patient observation with the standard operation sheet and a stop watch. Across the top of each sheet was the name of the process and down the left side was the machine or work classification name; depending on whether it was for machine or manpower observation. The time was then tracked and entered in the appropriate place on the matrix. In the last column each row was totaled and then inserted into a stacked bar chart. The bar chart became an excellent visual representation of how each machine is loaded at a process and how each operator is loaded at a process. The operator loading charts are presented in figures A-IV and A-V of Appendix A while the machine loading charts can be located in figures A-VI and A-VII of Appendix A. These figures were compared to the takt time with two goals in mind; that each man and machine has close to the same amount of process time and each process time would be within the takt time requirements. This data will allow for future balancing within the cell as demand and product changes.

While some of the team members were collecting the data to aid in the balancing of the cell, others were out walking the entire route of the parts. The starting point for this activity was at receiving and it ended at shipping. The route was walked with a measuring wheel and crudely mapped on a CAD drawing of the plant and distances were measured and noted. The purpose of this was for a visual representation of the route that was followed by both part and operator and to know the distance that each traveled. Figure A-VIII of Appendix A shows the existing flow chart of the two cells which is commonly called a ‘spaghetti diagram’. The number of backflows was also noted so that those could be eliminated wherever possible. With all this information on paper a total of nine backflows were found to exist. There were five backflows in the LCC and four in the SCC. Knowing this information and taking it into consideration during the design of the new cell will allow the team to eliminate many if not all of the backflows.

With most of the data collected the team was ready to optimize the layout of the cell. This activity commenced with a list of equipment and blank paper. Everyone was tasked with quickly sketching three designs for the new cell using the equipment on the list. Part of the goal of this activity was that everyone needed to be able to design a dream cell that had everything that was needed to accomplish the initial goals laid out. Once the sketching activity was completed the designs were presented for all to see and discuss.

Each layout was discussed and measured against the weighted criteria and the benefits and concerns with each layout were considered. Using this process allowed the team to narrow the number of possible layouts down to three. Further analysis was then completed to consider items like capital required; floor space consumed, and design sustainability. This included discussions with adjacent work cells to determine if any of the new designs would interfere with those operations. Using this process resulted in the team being able to achieve a design that met the goals laid out at the onset of the project as well as driving toward meeting the company objectives. When finally a cell design was agreed on by all the stakeholders it was time to begin the physical layout on the manufacturing floor.

The design that was chosen ultimately went against anything that has been done at BAPS in previous Kaizen events. This design has a main line, or aisle, with two feeder lines. The first feeder line is where the parts arrive for initial evaluation and machining. From there the parts are transferred to the main line where the bulk of the operations are performed. Because there is the need for some outflows though the parts travel to the other resources and then back into the second feeder line. Here the balance of the work takes place except for some final painting and curing operations. Then the part goes to final inspection and then on to shipping. Now that the team has a basic layout on which to build more detailed design work can take place to achieve the goals that were set at the beginning of the project.

A drawing of the cell was constructed in CAD to create a map of the cell and how it related to other features in the building which can be seen in Figure A-IX of Appendix A. Every piece of equipment was put into the drawing including transfer carts and work tables. This drawing was laid out as though it were a building unto itself so that as items were laid out on the floor there would be parameters from which to work.

Since the space for this cell was open through previous activities, the initial layout was accomplished through the use of “paper-dolls”. With the cell print in hand two team members began the process of using large rolls of paper to create each piece of equipment according to the size on the print. Meanwhile, other team members were at the site of the cell to begin the layout using masking tape. The tape was used to allow the team to quickly add and remove or change the location of aisle ways and equipment.

With the aisle ways laid out in tape the "paper-dolls" were inserted within the cell. Using this method gave the ability for all cell members to conduct a walkthrough of the cell with actual parts to ensure the cell would be functional and work as designed. The paper-dolls also allowed for the maintenance crew to come in and begin installing the electrical, air, vacuum, and venting that was required. Conducting this type of work in advance of the actual machinery placement gave a greater freedom for crews to move about without having objects in the way.

Upon completion of this project the team was able to achieve many of the goals that were laid out. The floor space requirement went from 5,385 square feet to only 2,710 square feet; a reduction of 50%. Inventory through work in process (WIP) went from 79 parts to 23 parts while travel distance was reduced by 82%; 5,699 feet to 846 feet. This decrease in travel distance is due to combining the cells with an appropriate layout and moving the new cell closer to the shared services that were not able to be moved to the cell. Some other improvements that were made were a lead time reduction from 48 days to 19 days while total cycle time was reduced from 2,634 minutes to 1,947 minutes. The last impressionable goal was that the total manpower required went from 27 people to 19 people. Reducing the necessary manpower for the new cell by 8 people means other areas can increase labor by that much. A summary of this data can be seen in the progress report in table A-II of Appendix A. These reductions have resulted in a leaner, more efficient Brothers Aerospace and Propulsion Systems to help keep the company competitive in the ever-changing market place.

CONCLUSION

The success of this project was the result of several factors but amongst them was the key factor of input. Specifically, any project will generally be as successful as the effort that was put into it. Accurate data played a large part in achieving the initial goals. As can be seen by the results in table A-II of Appendix A there were many valuable changes made to the way these parts are manufactured. There are however some other benefits to the completion of this event that need to be mentioned.

Adjustments in the work cell resulted in significant safety improvements. This was attributed to ergonomic improvements that were either intentional or as a result of indirect changes. An example of this was the reduction in part travel distance from 5,699 feet to a much more efficient 846 feet. In addition, the ergonomic risk of the reduction in part travel resulted in a lower likelihood of operator injury. The longer the distance an operator must travel to transfer parts the greater the chance for an ergonomic injury or some other accident such as a collision with a forklift or another operator.

The reduction in labor hours was also very beneficial to other work cells at BAPS. Becoming more efficient and dispersing the labor to other work cells has helped those cells become more productive. As a result of this one Kaizen event, the productivity improvements have been felt throughout the business. A reduction in labor hours and equipment has translated to another form of saving through the reduction in electrical usage. With fewer machines in use to accomplish the same processes, less time has been logged for running equipment. Because the cell has only been running for a short period of time it is difficult to indicate the precise savings but the team remains confident that electrical usage will be reduced by a substantial amount in the coming months.

With all that was accomplished there were still a few things that were not able to completed due to time constraints and capital appropriation issues. There were many pieces of equipment to unhook, move, and reconnect and all had to be accomplished without the customers noticing any changes to their delivery schedules. While about 80% of the equipment is in place and running, there is still 20% that needs to be moved as scheduling permits. The team has looked at upcoming schedules to help determine when the rest of the machinery can be unhooked and moved into its permanent location within the cell.

There was also the issue of not being able to acquire all the floor space that is ideal for the layout that was proposed. A portion of the area that was desired was needed by both this cell as well as the receiving department. Through negotiation there was some give and take resulting in a slightly smaller area than is ideal. Looking at the overall site plan however revealed opportunities in the future to reclaim that space from receiving after some other space is cleared for that department to move into. At current production rates this will not greatly impact production but as demand increases production will begin to be affected. This fact is going to drive the team and upper management to continue working toward the long term site plan so the improvements can continue.

The key factors for this event were not that everyone was experts or knew all there was to know about a Kaizen event but the fact that there was diversity amongst the team. Everyone had different ideas that were driven by the data and the goals. Not all the time did people agree or get along but the thing that the team did have was an open mind and the willingness to create a new cell that will help the greater company achieve its goals. Listening to the data was just as important as listening to a team member. Having the proper data was essential to making solid business decisions because without the data, holding an event to build a new cell would be much like trying to go on a trip without a road map. Good data and a diverse team were the road map to success for constructing a new cell to help BAPS continue successfully into the future.

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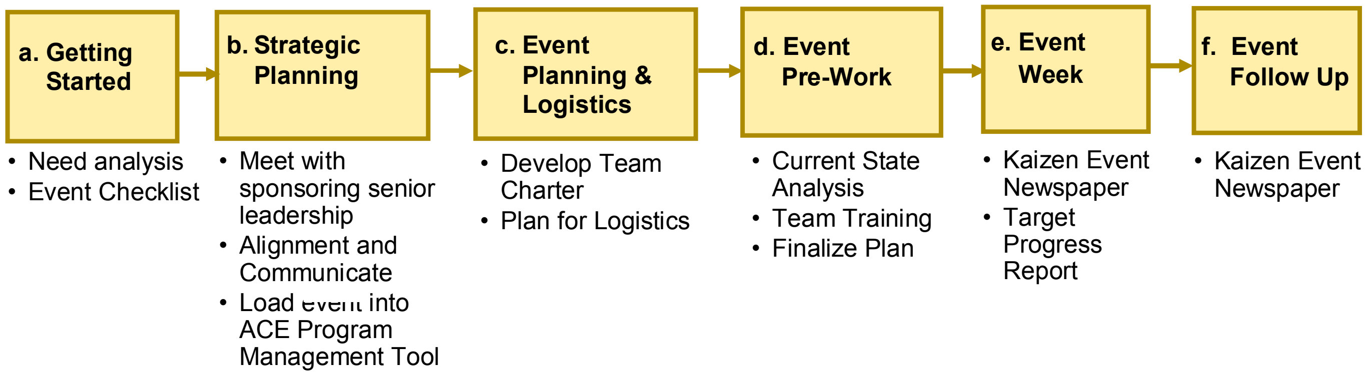
Appendix A



Business Performance Improvements

- What to expect from a Kaizen Event and effectively applying the Lean Operating System

Lead-time	⬇	decreasing
Inventory	⬇	decreasing
Quality	⬆	increasing
Total Product Cost	⬇	decreasing
Market Growth	⬆	increasing

Figure A-I: Kaizen event process map showing high level tasks

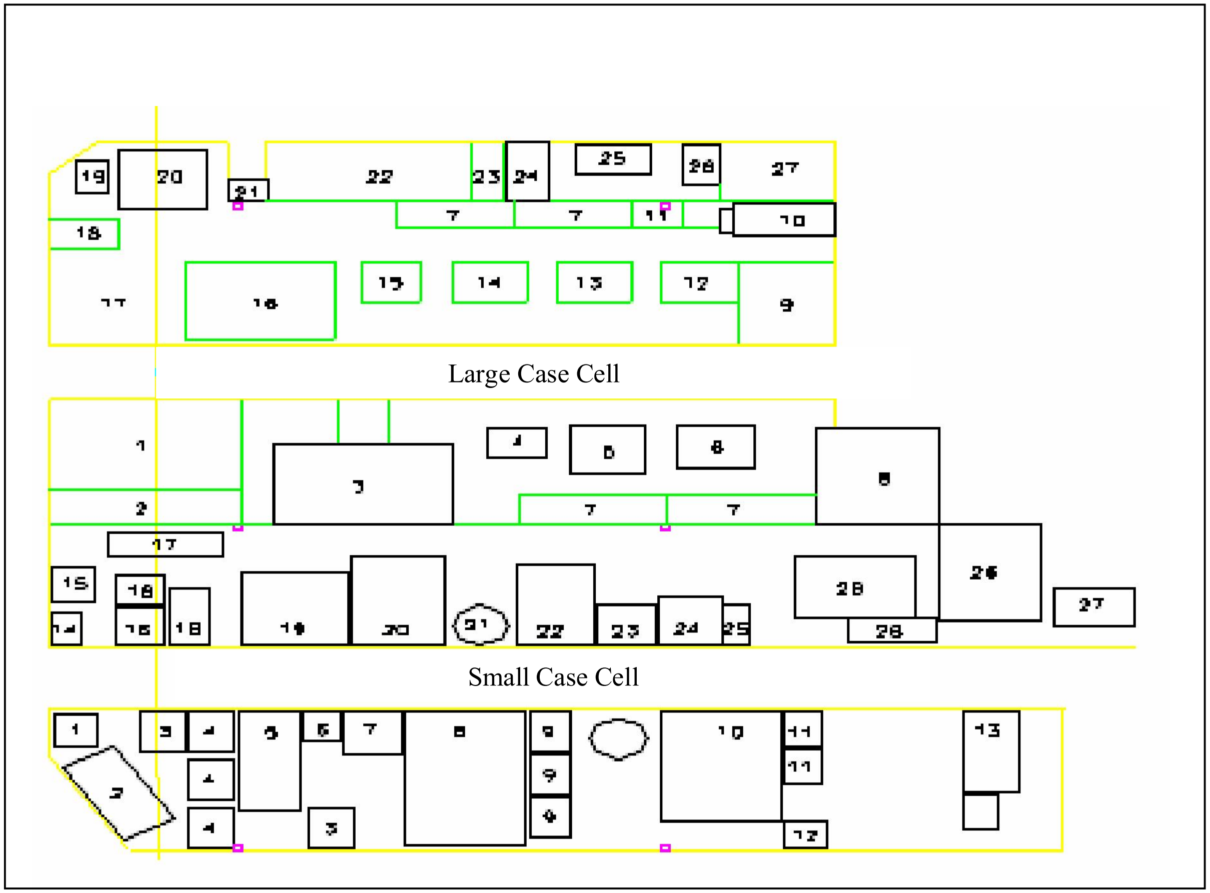


Figure A-II: Current state map of subject cells prior to execution of Kaizen event

Approximate Time Spent Not Working On Parts.

- Includes waste disposal, restrooms, etc.

365 Days / Year - 13 Holidays = 352
352 * (5/7) = 251 Working Days
251 / 12 = 21 Working Days / Month

5. System Constraints	
Shop Efficiency	
Inefficiency Burden	10%
% SI (Efficiency)	91%
Average Batch Size	1
Annual Reduction in Process Tim	0%
Human Time Available	
Hrs/Day	7.60
Normal Days / Month	21
Weekend Days / Month	4
Less Absentee & Vac	6.0%
Minutes Available/month	10,716
Machine Time Available	
Minutes Available/ month	12,000

Available Time To Work Parts.

- Based on (1) eight hour shift
- Adjusted for breaks, meetings, CI, & OJT

Based on 3.0 years average seniority

LCC Cell

$$\frac{\text{Avaliable Machine Time (Min/Month)}}{\text{Customer Demand}} = 114.3$$

SCC Cell

$$\frac{\text{Avaliable Machine Time (Min/Month)}}{\text{Customer Demand}} = 185.1$$

Figure A-III: Current state takt time calculation for the LCC and SCC cells.

Table A-I

Standard work combination sheet showing cycle time at each step in the process

		Skill	Laser	Rec	Dirty	Bond	Bond	Bond	Bond	Bond	VTL	Assy	Assy	Kev	Kev	Assy	Bond	Assy	Assy	Clave	Clave	Kev
Process	Grand Total		Inspector 1	Inspector 2	Production Mechanic 1	Production Mechanic 2	Production Mechanic 3	Production Mechanic 4	Production Mechanic 5	Production Mechanic 6	Production Mechanic 7	Production Mechanic 8	Production Mechanic 9	Production Mechanic 10	Production Mechanic 11	Production Mechanic 12	Production Mechanic 13	Production Mechanic 14	Production Mechanic 15	Production Mechanic 16	Production Mechanic 17	Production Mechanic 18
Receiving Inspection	8			8																		
Disassembly	23				23																	
Bond Cavity Strip	-																					
Media Blast	26				26																	
Bond Media	9				9																	
First Bond	305					76	76	76	76													
Autoclave	32																			32		
Demold / Deflash	38																			38		
Second Bond	77									77												
Autoclave	32																				32	
Demold / Deflash	21																				21	
Finish Front Flange	14				14																	
Oven	1				1																	
VTL	26										26											
Sanding / Finishing	77											77										
Rubstrip Patch	11																11					
Oven	9																9					
Laser	50		38								12											
Profile Inspection	35		35																			
Stud Bond	26												26									
Oven	3															3						
Hardware Install (Boss, Inserts, Studs)	13																		13			
Kevlar Wrap	171													85	85							
Sleeve Installation	23												23									
Oven	3															3						
Demold / Deflash	22												22									
In-Process Inspection	28			28																		
Prime and Paint	56															56						
Oven	3															3						
RTV	5																		5			
Bonding	34																34					
Autoclave	4																				4	
Demold	10																	10				
VTL	-																					
Deflash	6																	6				
Machining	14																	14				
BTM/Visual Inspection	2			2																		
Install Hardware	18																	18				
Bushing Repair	9																	9				
Install Capture Flange	5																	5				
Filling	2																	2				
Oven	0																	0				
Final Machining	2																	2				
Inprocess Inspection	1			1																		
Prime/Paint	9															9						
Oven	1															1						
RTV	3																		3			
Finishing	9																		9			
Part Mark	33																		33			
Final Inspection and Weight	20			20																		
			73.3	59.3	72.3	76.3	76.3	76.3	76.3	77.4	37.6	77.3	71.5	85.5	85.5	74.8	53.3	66.5	63.7	69.8	57.6	0.0
			73.5	73.5	73.5	73.5	73.5	73.5	73.5	73.5	73.5	73.5	73.5	73.5	73.5	73.5	73.5	73.5	73.5	73.5	73.5	73.5
			-0.2	-14.1	-1.2	2.8	2.8	2.8	2.8	3.9	-35.9	3.8	-2.0	12.0	12.0	1.3	-20.2	-7.0	-9.8	-3.7	-15.9	-73.5

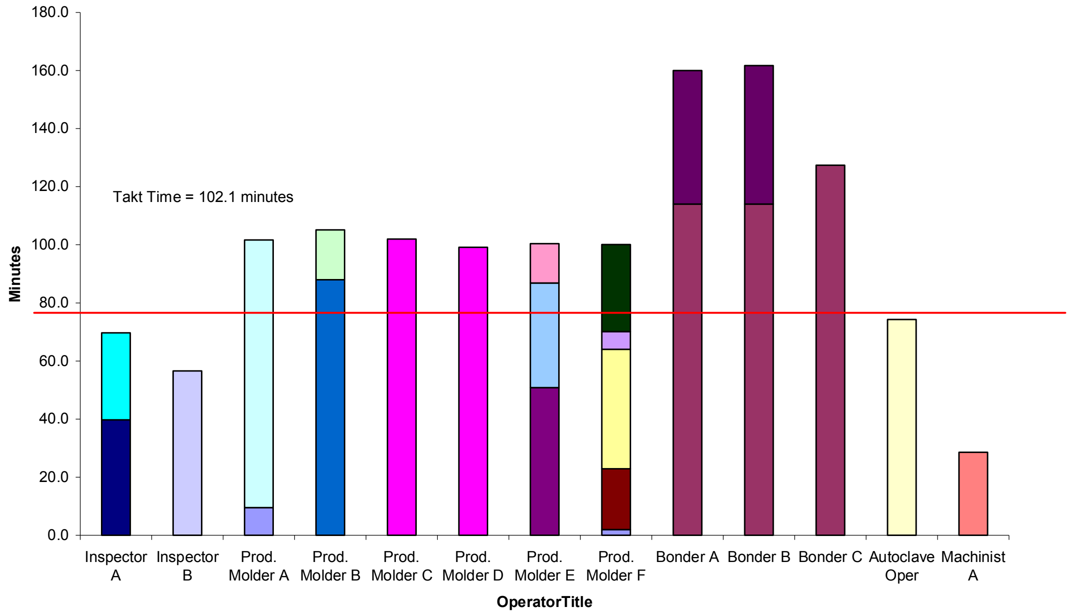


Figure A-IV: Current state loading analysis showing un-balance of operator work load for the SCC component.

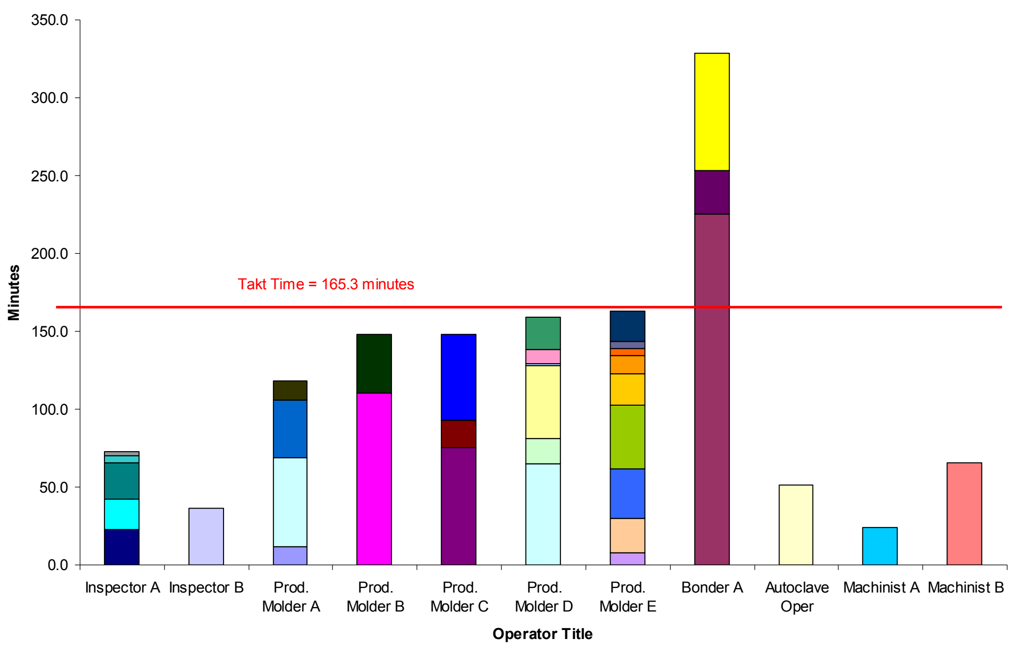


Figure A-V: Current state loading analysis showing un-balance of operator work load for the LCC component.

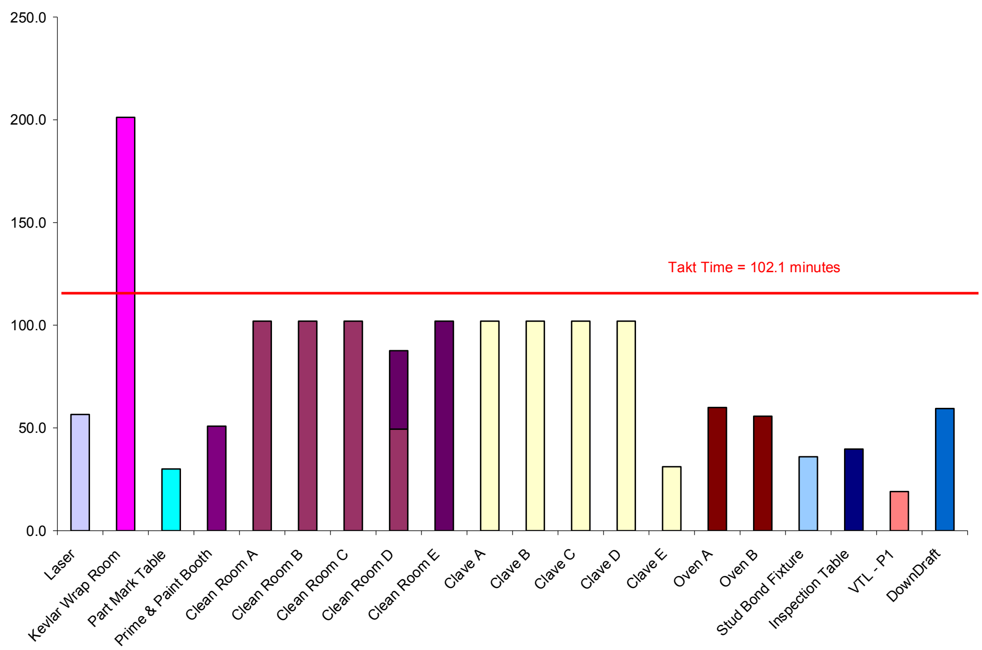


Figure A-VI: Current state machine loading analysis showing un-balance of work load for the SCC component.

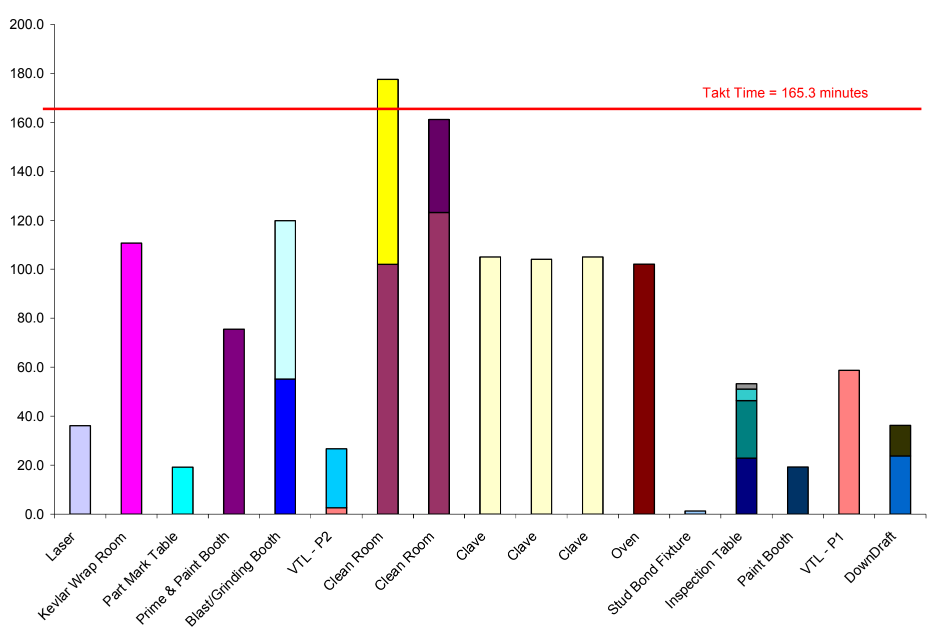
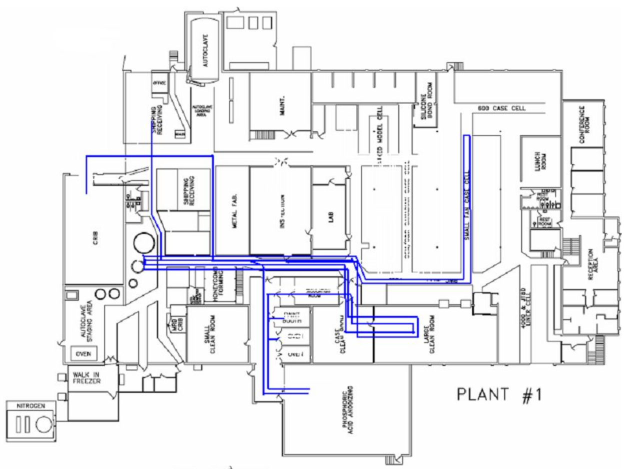


Figure A-VII: Current state machine loading analysis showing un-balance of work load for the LCC component.

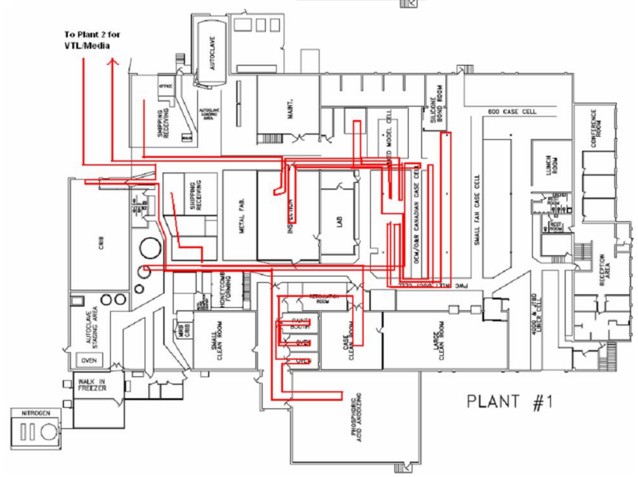
LCC Cell



Worst Case Scenario

P/N: 30C4286-01 PW308
Part Travel Distance: 1500 feet
Reversals: 4
Entries/Exits: 1/1

SCC Cell



Worst Case Scenario

P/N: 3119760-01 JT15D
Part Travel Distance: 4,199 feet
Reversals:
Entries/Exits: 5

Figure A-VIII: Existing spaghetti diagrams for the two cells at BAPS targeted for combination

Figure A-IX: A detailed floor plan of the proposed merged manufacturing LCC cell at BAPS

Table A-II: Data Summary which displays the measured improvements in the new merged LCC cell at BAPS

Team #:	3	Takt Time:	73 Minutes
Cell #/Name:	Case Merge	Vol / Mth:	146 Per / Month

	Newspaper Item	Start	Goal	Day 1	Day 2	Day 3	Day 4	Result	Total Change
RFC Space (Sq. Ft.)		2,095	3,124	3,124	3,355	2,710	2,710	**2710**	-50%
PWC Space (Sq. Ft.)		3,290							
RFC Inventory (WIP)		11	22	11	11	11	23	**23**	-71%
PWC Inventory (WIP)		68		68	68	68			
RFC Part Travel Dist (Ft)		4,199	1,000	4,199	4199	4199	846	**846**	-85%
PWC Part Travel Dist (Ft)		1,500		1,500	1500	1500			
RFC Lead time (Days)		27	19	27	27	27	19	**19**	-60%
PWC Lead time (Days)		21		21	21	21			
RFC Sum of Cycle Time (Min)		1,334	1,000	1,334	1334	1334	1,947	**1947**	-26%
PWC Sum of Cycle Time (Min)		1,307		1,307	1307	1307			
RFC Manpower		9	20	9	9	9	19	**19**	-35%
PWC Manpower		18		18	18	18			

Expediter Process for Escalating Issues Regarding On-Time Component Delivery

XXXXXXXXXXX

Faculty Advisor: Andrew Purvis

Ferris State University

Capstone APPS499

April 26th 2009

Letter of Transmittal

XXXXX
1234 Main Street
Grand Blanc, MI 48439
April 12, 2009

Andrew Purvis
Program Advisor
Ferris State University
1201 S. State Street
Big Rapids, MI 49307

Dear Dr. Purvis,

Enclosed is a copy of “Expediter Process for Escalating Issues Regarding On-Time Component Delivery”. This report is a summary of findings from the work that my team I completed during the winter of 2008-09. It will aid in the lean methods of continuous improvement at Delphi Prototype Operations in Saginaw. I completed the report on schedule and met all my proposed objectives within the allotted requirements.

As promised in my proposal, this report includes information on improving the delivery metric in the available baseline measure. This information has been compared and contrasted with two applicable case studies. The first study was “Management control of supplier relationships in manufacturing” and the second was a “Method and Apparatus Providing a Supply Chain Management System Useful in Outsourced Manufacturing”. This report also includes an analysis of the improved manufacturing process including the trigger used to escalate issues. Through this research, I found that most personnel had some sort of escalation process each followed but was one that was not standardized by all groups at Prototype Operations. This research suggests that the Expediter, which is major contributor to the process, did not have the necessary tools or guidance to successfully complete tasks. This report also outlines controls for continued monitoring of the improvements made.

If you have any questions and/or comments regarding the interpretation of this report please feel free to contact me at the address above. Thank you for your consideration, and I look forward to working with you again soon.

Sincerely,

XXXXXXXXXXXX

Enclosure: Final Report

Table of Contents

Abstract Summary

This paper studied the process by which an Expediter initiated, tracked and received manufactured components. The Expediter had the responsibility to communicate information to all personnel relative to the components being tracked and ensured that the deliveries of the components were met on the required dates. Delphi Prototype Operations Plant 14 had focused a project specifically on delivery and implemented the project of "Expediter Process for Escalating Issues Regarding On-time Component Delivery".

Approximately 85% of prototype business had been getting the components received on-time. Historically there had always been 5-9% late components, which drove premium costs and created crisis time management later in the effort. As a tier one supplier, Prototype Operations had to receive manufactured components on-time so as the delivery to Delphi customers were on-time. The research suggested that the process that had been followed was similar in nature with other personnel in the building but not within consistent methods. The main areas of concern fell within communication between suppliers and the transfer of information between relative personnel at Prototype Operations.

The goal of the project had been to reduce late supplier delivery by 50%. The project scope or purpose focused on the delivery to Prototype Operations from production, prototype and plant suppliers. The project did not focus on Delphi outgoing shipments. The estimated financial impact of the project was a cost savings of less than $100,000 annually.

The methodologies used followed the DMAIC process of Define, Measure, Analyze, Improve, and Control. The research conducted had outlined the thought process relative to the improvements made which included current state, analysis, future state, and controls necessary to sustain the improvements. The idea behind the research had been to provide the Expediter with a standardized process that allowed better communication for all product lines at Prototype Operations and associated suppliers. The tools used had helped understand four main areas of concern of which were all related to communication. The four areas of concern involved Expediter communication, engineering communication, supplier communication, and supplier shipping. The current state process was refined to a future state process which adapted a framework to all product lines and suppliers specifically in understanding how and when to communicate the progress of the manufactured components and assist on deliveries to be met as required. The future state process also incorporated a trigger to raise awareness of potentially late arrival of material. The goal of the project was met by reducing late deliveries by approximately 70%. The 70% reduction sustained the current customer base and helped improve the company credibility towards future business with new clientele.

Introduction

Delphi Steering Prototype Operations supplied prototype parts for new vehicle programs worldwide. The corporation focused on the steering systems of four products lines such as Hydraulics, Electronic Steering Systems, Columns, and Driveline Systems. The Steering headquarters was located in Saginaw Michigan but their global footprint supplied customers such as GM, Ford, Chrysler and their global joint ventures. Prototype volumes have fluctuated due to the recent unstable economy in late 2008. Typically volumes have averaged from eight to ten thousand units annually between the four product lines. The components required for Delphi customer requests were manufactured by local and overseas outside suppliers, or Delphi production plants. It was common for the Prototype Operations to experience problems when approximately 91-95% of the procured material and related components were received on-time. As a result, incoming parts received late by assorted suppliers delayed Delphi outgoing shipments and overall customer satisfaction. The scope of this project had been narrowed to incoming parts needed for outgoing assemblies which allowed the project to be more manageable. The repercussions of receiving materials and components late involved expedited shipping costs and high costs paid to suppliers to help meet required due dates. In some cases a supplier was awarded the work originally, and then paid a price premium to make sure it was completed on time. Poor communication was regarded as the culprit to these problems. Early notification of issues was critical and having a trigger for them early in the process helped reduce the volume of late receipts. Communication was categorized by both internal Delphi communication and outside supplier communication. The internal Delphi communication involved team members of individual product lines and, other product lines, as needed. Prioritization of processed parts were escalated within Prototype Operations. A trigger was incorporated which allowed outside supplier communication to capture potential lost time early in the process. Originally there were no alerts that suggested the delivery of parts would be late at any time frame of the procurement process. An alert allowed a more easily attainable process for escalating the issue and capturing the out-of-control process before adding resources and increasing costs.

It was generally five times more costly to recruit a new customer than to retain an existing one (Smith 2004). The situation addressed previously resulted in cost savings that encompassed current as well as future customer requests. The current process was addressed to reduce the late receipts and subsequent shipments. The communication of scheduling between all parties required substantial improvement. Best practices were followed and improved in the current process which was expected to reduce operating costs drastically. The addition of a trigger into the current process allowed for better control. Improving the process was vital to reducing variation and establishing foundations for further process improvement.

The goal of this project was to reduce late incoming deliveries by 50% which resulted in high costs related to prioritizing supplier scheduling and shipping. Major milestones were recognized at the five stages of Six Sigma which involved Define, Measure, Analyze, Improve, and Control (DMAIC). A project charter and dynamic map of executed steps throughout DMAIC fulfilled the Define milestone. The Measure and Analyze milestones overlapped slightly which incorporated the current state map with the Failure Mode and Effect Analysis (FMEA). The established current state map allowed a better understanding of the process and the variations that existed in the process. The variations were represented by the highest Risk Priority Numbers (RPN) calculated at the end of the analyzed FMEA. Brainstorming of potential solutions represented the Improve stage through the use of the future state map. Controls were established to keep variation in the process minimal. The current baseline measure tracked the percentage of late shipments along with those of the new process were compared to demonstrate the reduction in late deliveries. The cost savings were captured to show the benefits of the updated and standardized process. This was expected to involve a comparison of the resources required previously to those required in the new process.

Literature Search

Delphi Prototype Operations placed focus on customer requirements. The main focus suggested that the customer target value was attained (Weingartz, 2008). The target value was closely related to the quality expected. Quality may have been thought to have two main divisions such as a product or service received. Other major components to quality included cost, delivery, and conformance to specifications. Through past metrics, historical data suggested that Delphi internal processes would run smoother and more cost effective if a supplier could achieve the target delivery dates.

The internal metric that drove the need for a process improvement stemmed from late deliveries that were sent to Prototype Operation customers and high costs associated with part procurement. Delphi strove to exceed customer satisfaction and late deliveries did not fulfill that requirement. Various high costs matured when timing was delayed. Communication was a strong input in helping standard operating procedures to be standard. As the title suggested, the Expediter was the key player to a successful completion of the procured material and related parts. The Expediter was the main contact point and transfer of information between various personnel of the functional organization. The boundaries of the project process started from the issuing of the purchase order from Delphi to the supplier and ended when the parts were received into the internal database.

Approximately thirteen process steps were mapped out between the boundaries of the project. Typical process mapping involved the activity that was occurring, inputs that were needed for the activity, and the desired output (F. Gray 2006). The first process step incorporated the Expediter providing all the necessary resources for the supplier to complete the request. The second process step had the Expediter following up with suppliers and was where the bulk of the time was gained, lost or indifferent. The major question that was asked was “will the supplier be on-time for the set delivery date”? The process trigger or alert was sometimes lost at this stage. The only dependence on a current trigger was individual competency. Obviously if the part had been “on-time” then the process moved forward. If the part was not “on-time” then a hierarchy of events had occurred. Sequenced if-then decisions helped the Expediter escalate the issue and bring focus to out-of-control part processing. Early analysis of the Failure Mode and Effect Analysis (FMEA) suggested that the majority of the problems lied in the six process steps following the Expediter follow up with supplier. The FMEA tool was a guide to analyzing, in an organized manner, causes of possible process variation (Javier Santos 2006). The six process steps were identified but never as standard operating procedures in the process mapping stage. There was major fall out when the sequence was not understood or escalated as needed. Information was lost and never transferred to the team members that coordinated the components into Delphi’s Prototype assemblies. Transferred information was important since it trickled down to Delphi customers when the time lost was not captured early. After the first eight process steps, there followed five more but of much smaller magnitude in grouped cause Risk Priority Numbers (RPN in FMEA). The totals of thirteen process steps had various inputs (factors) and outputs (responses) that defined the process steps, activities, or tasks. The thirteen step process map can be reviewed under Figure 1.

An investigation of similar situations involved two case studies. The first case study investigated is “Management control of supplier relationships in manufacturing: A case study in the automotive industry” (Pernot, Eli & Roodhooft, Filip 2008). The Pernot and Roodhooft research studied management control design of supplier relationships in manufacturing. The research in this case study found a combination of formal and informal controls. Supplier relations in manufacturing were more formal, so that they could be governed by more formal and less informal controls (Pernot, et al., 2008). In comparison, to Delphi Prototype Operations, the process steps that involved follow up, triggers and communication suggested that more formal controls of escalation were needed.

The second case study that was investigated was a “Method and apparatus providing a supply chain management system useful in outsourced manufacturing” (Hickman Palermo Truong & Becker, LLP. 2007). The difference of this case study from the Delphi Prototype Operations project was the width of the scope. The researched case study mapped the process to the company’s customer or end user while Delphi was bound as the end user. Delphi customer outgoing shipments were considered “out of scope”. In the Delphi Prototype Operations process observation, the supply chain discussed in the following example pertained to the internal (Delphi personnel) and external personnel (suppliers). According to the aspect of the second case study, information representing one or more supply chain events was received from each of the supply chain partners in a database. They incorporated a public network that allowed the ease of communication. One or more rules were applied periodically to the supply chain event information, resulting in generating one or more alerts pertaining to one or more discrepancies that were found. The alerts were then communicated to all participating partners of the transaction of which the discrepancies relate (Hickman et al., 2007).

The three projects shared a distinct similarity. As noted in the Hickman et al., research, the outsourcing company lost a degree of control over the manufacturing process. There was a need to communicate other kinds of signals, requests or instructions to all supply chain partners. For example, a company sent material move signals, supply status requests, and received exception conditions to or from all entities involved in the supply chain. A deficiency of past approaches pertained to decision-making. Existing systems provided no alert or trigger to request action when problems arose, and no way to guarantee that appropriate action was taken in response to problems (Hickman et al., 2007). Hence, there was a need for escalating the issue to alert messages in response to problems, and enforce an organized process of responding to and acting on the alerts.

Alternatives Investigated

The one important aspect in problem solving was to understand and reiterate the goal (F. Gray 2006). Any project, whether at work, school, or home can easily carry outside the project boundaries. This project was titled “Expediter process for escalating issues regarding on-time component delivery”. As a synopsis to what occurred originally, the team had been influenced from outside sources that guided an answer which may not have been the answer to this particular project. From the first day, there had been personnel that were involved with the project that had predetermined answers. Once the determination was made, the disease had spread throughout the group, infected the project sponsor, core members, and support members. The thought process of the entire project veered towards subjective data leading to the predetermined answer.

The entire thought process started with the tools chosen to uncover the answers. Included with the projects work log was a visual representation of the thought process via a thought map (TMAP) as presented in Figure 2. Through Six-Sigma the Define, Measure, Analyze, Improve and Control (DMAIC) process was used. The TMAP helped visually understand the questions asked and the actions taken using the DMAIC method. Tools such as a Process map, Failure Mode & Effect Analysis (FMEA), and Pareto chart were vital to direct towards the answer. The FMEA and Pareto chart presented more detailed information and will be addressed in detail in subsequent sections of this document. The define stage of any project is critical. The initial responses that were given in the class discussions also reiterated this as the most important stage to any project. First, comparing the original predetermined project answer, the process map was created (PMAP), as presented in Figure 3. As the PMAP was being compiled, the team had a very good understanding of the current procedures that were followed. However, procedures did not necessarily tell whether a process was truly being followed.

By reviewing the current portion of the value stream map under Figure 4, the team was led to believe that current operating procedures were missing vital portions that were important to the project. Much of this was due to the predetermination of the outside sources.

The outside sources included companies such as General Motors and Ford. The two companies used an on-line system that helped communication between customer and supplier. Weekly and sometimes daily status reports were required via this on-line system. The on-line system worked extremely well as used by Delphi in response to customer questions or issues. The team tried using somewhat of a benchmarking strategy to fix the problem before understanding what it truly was. Simply rereading the project title gave the team an idea that this was not the answer. The idea of this on-line system was based off the main problem being external communication issues from supplier to customer. The project title recaptured the boundaries of the project which started with internally escalating any issues and then possibly communicating externally.

Weeks of work on this project had to be recaptured. The FMEA had helped generate Risk Priority Numbers which then transferred visually into a Pareto chart. Once the Pareto chart was uncovered, some obvious key element or elements were missing. The team had gone back to review the PMAP. In the second review of the PMAP, presented previously in Figure 1, the true process was followed which revealed that five additional process steps were missed. These steps stemmed from a simple question asked by the Expediter, “Are the components going to be delivered on-time”? The question was important to the project as the process looped in the PMAP until the parts were received on-time. If the components were not received on-time then some method of incorporating a “trigger” would be needed to raise the escalation process that was uncovered when the PMAP was generated the second time. The “trigger” initiated a set of if-then statements in the PMAP which helped escalate the issue until some form of action helped convey components to be received on-time. One main understanding the team possessed toward a solution was to standardize the escalation portion. The escalation portion was not part of the standard operating procedures and any new or inexperienced Expediter may have struggled to understand what communication was needed to help receive the components on-time.

The FMEA, documented in the Appendix under Figure 5, had been reanalyzed in various ways which helped understand better defined causes. Just as the define portion of the project was important, the analysis of data was just as important. The project boundaries were captured and the problem pin-pointed. The definition of the Pareto typically tells that eighty percent of the problems originate from twenty percent of the causes (Weingartz, 2008). The data from the FMEA was viewed and compiled into a Pareto chart at least four different ways. The most obvious methods towards a solution were by process step and by causes (Weingartz, 2008). The process step Pareto, later documented in the text under Figure 6, unveiled that the portion involving a needed trigger towards escalation was the highest in priority. The idea of an alert or trigger communicated the issue until the alert was resolved (Hickman et al., 2007). Process steps involving the new escalation portion were stacked and involved the second highest priority. The process steps of escalation were stacked in the Pareto because they all stemmed from the trigger question and were all part of the escalation process. The third highest priority involved shipping issues such as packaging, carrier level knowledge, and customs knowledge.

The second Pareto chart analyzed was by causes of late arrivals and presented later in text of this document under Figure 7. The Pareto chart by causes displayed where most of the concrete decision making happened in order to justify the improvements (Weingartz, 2008). The Pareto chart was stacked by “like” causes because each output in each process step had similar issues. The Pareto chart had unveiled that Engineering Communication (internal), Expediter communication (internal), and supplier communication (external) included the highest causes in the FMEA. Most of this fell into the process steps with highest RPNs associated with each respective cause.

As a result of the information presented in the Pareto chart, the project sponsor created a power point presentation which helped train engineering on the specific requirements. A fix involved the PC&L manager incorporating packaging specifications to Delphi Prototype Center purchase orders which helped the shipping problems. Another fix involved a standardized process of escalating issues and was incorporated in the company value stream. The escalation process entailed training towards all personnel involved with the escalation portion.

The reasoning behind creating multiple methods of analysis in the FMEA was to give obvious evidence of the problem or problems to fix. A perfect Pareto chart would address the highest bar on the chart or area to focus. In this particular project the Pareto chart did not give obvious priority, as there was no specific numeric data to analyze. Therefore, the Risk Priority Numbers (RPNs) were generated by a four point scale as presented in figure 8. Once the final RPNs were available, an understanding had been made that a five point scale would have been more effective. The five point scale may have shown better separation to the process steps and causes that involved most of the problems. This was the reasoning for compiling a Pareto in four to five different ways. The causes to the underlying problem were still captured but if time allowed then rescaling the RPNs may have shown even more obvious direction towards improvements chosen.

Discussion and Analysis

The prototype industry had relied heavily on its flexibility to produce new products. Flexibility can be defined as a systems ability to react to potential internal or external changes that occur and affect its delivery in a timely and cost effective manner. Consequently, flexibility as it relates to engineering, involves the ease with which engineering and its systems can respond to uncertainty in a manner to sustain or improve its delivery. Uncertainty can create both risks and opportunities. The existence of uncertainty gives value in being flexible. As one of the prototype industry leaders, Delphi Prototype Operations has had the task of also sustaining or improving its flexibility. The systems of flexibility that represent Delphi Prototype Operations are represented in the hierarchy of its functional organization, displayed in Figure 9 of the Appendix (Gray 2006). The hierarchy was represented by manufacturing engineering, product engineering, purchasing, quality assurance, operations, finance, and production control & logistics (PC&L) groups. All the groups of the functional organization have had an impact on the business and could be seen through the company's value stream, displayed in Figure 10. Delphi Steering Prototype Operations supplied prototype parts for new vehicle programs worldwide. The worldwide customers included, General Motors, Ford, Chrysler and all the relative joint ventures (i.e. GM Korea as Daewoo). Due to the recently experienced global economic downturn in late 2008, Prototype Operations has had to accomplish a way to maximize profits with limited resources in order to survive. The idea of flexibility will continue to be critical to the future of Delphi Prototype operations.

Delphi Prototype Operations practiced lean manufacturing and incorporated a strong focus toward continuous improvement. The Prototype Operations vision has been to exceed customer expectation through continuous improvement and most levels of management have done well incorporating the vision into the workplace atmosphere. As the industry has evolved, Prototype Operation's customers have gradually increased requirements. An obvious increase throughout the years had been the need to process a product quickly from the drawing board to possession of the consumer. Steering assembly volumes continued to decrease as the turn rates of projects continued to increase. The flexibility discussed previously had been the desired output to the ever changing requirements. One of Prototype Operations 2009 initiatives involved adhering to the new era of customer's requirements. Beginning from the time frame of 2006, one of the focal points to the customer's requirements had been the short lead times on the purchase orders provided to Prototype Operations for requested assemblies. Prototype assemblies have typically required twelve weeks after receipt of the purchase order to manufacture. Some of the most recent purchase orders provided had given lead times less than four weeks. In some extreme cases, the purchase orders had been past due as received and negotiations between Product Line managers and customers have had agreed upon dates of "as soon as possible". In keeping with the Prototype vision, the customers have usually benefited from the negotiations. The problem at end of the negotiations involved getting the requests processed on-time and at the lowest cost possible. The focus on continuous improvement had been more important than ever. Customer requirements have become more strict and productivity had been targeted to increase with the recent economic times. More output had been required with less input, hence the flexibility mentioned previously.

Prototype Operation's past process improvements had followed Six-Sigma via the Define, Measure, Analyze, Improve and Control (DMAIC) stages (Weingartz, 2008).

One previously researched project had generated the measures needed for the currently researched project. The previous project will be detailed later to detail its significance. The Six-Sigma DMAIC problem solving stages have also been applied to the current project. The tools used throughout the DMAIC stages will be discussed to explain how they were chosen within the various stages.

Define

Identify Improvement Opportunities

The Define stage of DMAIC helped clarify the description of the problem and what metrics were impacted. There had been repercussions for outgoing customer shipments when delivered beyond the due dates. For example, General Motors had issued formal complaints such as Problem Report and Resolutions (PR&Rs). The complaints not only penalized by debiting thousands of dollars but also internally have shown to acquire high costs due to the lengthy research and reports that needed to be written. Even when due dates had not been met, high costs had been acquired from expedited shipping. The high costs had included incoming components and outgoing assemblies shipped to customers. If pallets of components were shipped overseas to Delphi customers, various low cost levels of shipping had been charges paid by the customer. However, the customer’s delivery dates had been the drivers to the level of shipping required. If component builds ran behind, expedited outgoing shipments were required to meet the customer’s due dates and therefore charged to Prototype Operations. The process improvement that had been researched stemmed back to the beginning of the procurement of parts for outgoing assemblies. Historical evidence had shown that 5-9% of incoming components had been late. According to the company value stream presented previously in Figure 10, the cycle time suggested that approximately 85% of Prototype business had been getting incoming parts received on-time. Therefore, the longest cycle-time or critical path of the value stream had been the manufacturing of parts (F. Gray 2006).

Team Building

Lead times for requested assemblies had decreased and the critical path has been established. An action plan was needed to improve the timeline in processed or manufactured new components. Under direction from the project sponsor (Prototype Operations manager), a three person Core Team was assigned via the managerial staff’s decision. The three person Core Team included personnel from the Electronic Steering, Hydraulic, and Driveline Systems groups. The personnel involved had direct inputs in the procurement process. One of the members was an Expediter and the other two members were Material Coordinators that managed the Expediters. The assigning of a team leader was a decision based on experience. This experience included knowledge of company policy, procedures, past part processing, managing, and camaraderie of personnel throughout the organization. The camaraderie with plant personnel was a key ingredient in choosing the team leader as it helped to attain applicable input and resources for the research throughout the functional organization (F. Gray 2006). The previously mentioned metrics of late incoming components have been documented and captured on the Project Charter, which is offered in the Appendix of this document as Figure 11. The Project Charter had discussed key elements of the project and had been vital in referring back to when the Project Scope crept outside the boundaries.

Document Current Performance

The beginning of the project involved two important components to be understood. The first important component was to understand the current measure of late incoming components and the second was to incorporate the best tools that supported the Six-Sigma DMAIC method. A previous project at Prototype Operations involved gaining an understanding on the performance of the parts supply base. The previous project and its accuracy would have proven to be the main measure in understanding the history of late deliveries. The previous project had developed a supplier index rating that helped Prototype Operations document various aspects in supplier performance called Supplier Performance Index (SPI). An example of the SPI can be reviewed in Figure 12. The various aspects involved seven categories that helped to pin point key measures. The seven categories consisted of non-critical and critical first time quality (FTQ) issues, non-critical and critical formal outgoing customer complaints (PR&R), internal customer complaints, incoming documentation non-conformance, and most notably late deliveries of which examples are displayed in Figure 12. Of the seven categories, delivery was the only category focused on in the project. Each of the seven categories had a weight associated with level of importance which then formulated a final Supplier Performance Index rating. Previously, shipping costs were discussed. The significance to the categories in the SPI, relate to costs associated in weekly quality meetings. The weekly quality meetings gathered various management, quality, purchasing and production control and logistics (PC&L) personnel. According to a Delphi quality manager, some of the weekly quality meetings were lengthy and exceeded one hour or twelve percent of daily work. The measures provided by the SPI had been available for approximately one year. Through the documented measures, late deliveries had involved the most demerits to date. The SPI was the only baseline measure for delivery of incoming components.

While the SPI was the chosen baseline measure for incoming parts, the need to understand how the late delivery demerits were assigned became vital. The demerits stemmed from a linked access database. The linked access database was a tracking system each Expediter used when following manufactured parts and is presented in Figure 13 of the Appendix. The tracking system transferred all the information from the original purchase orders that were submitted to suppliers. The original purchase order included the Prototype Operations requirements as the customer to the supplier. The tracking system was to be updated whenever any information was changed or communicated relating the manufactured parts in process. The key component of this tracking system was that it linked to the SPI via the delivery date. When the parts were received, they were logged into a receiving access database. The received information was linked between systems and then was transferred into the Expediter parts tracking system and further transferred into the SPI if late. The Expediter had been assigned the responsibility to manage the time allowed for processing the parts through the tracking system and made adjustments as needed. Typically there would be no adjustment of the supplier's due dates unless the timing was delayed because of Prototype Operation's issues. The ultimate goal of utilizing the SPI was to only target late deliveries due to supplier issues and further detailed in Figure 12.

As the title of the project suggests, "Expediter Process for Escalating Issues Regarding On-time Component delivery", needed to have some boundaries associated with it. The first tool to be defined at any level of problem solving would involve a method of understanding what outputs are desired, what process step or steps create the outputs, and the required inputs to achieve the process step (Weingartz, 2008). The idea of Inputs-Process-Outputs helped to set up boundaries and scope the project. The simple idea of the set boundaries gave the team a starting point to help narrow down the process map that will follow in the Measure stage of DMAIC.

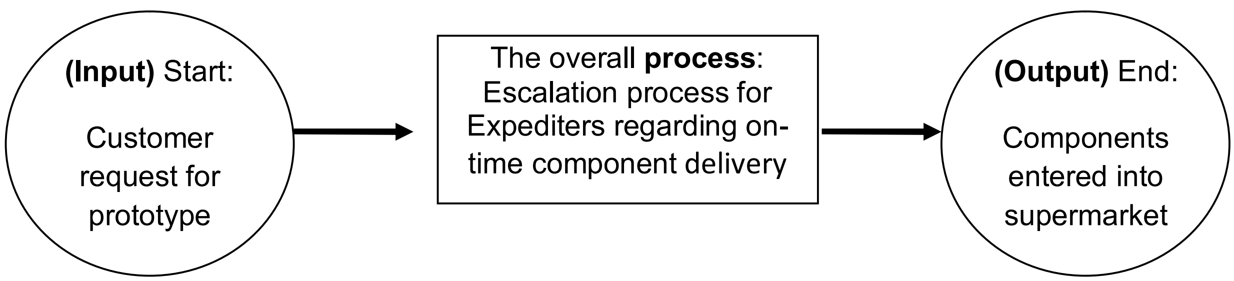


Figure 14 shows the basic requirements that need to be understood in order to find the eventual root cause of the problem. This method is used as a starting point and can then be minimized in the final process map.

Measure

Document Current Process (Expanded Boundaries)

The stages of DMAIC tended to overlap. The last component of the define stage had given the boundaries needed to begin mapping out the current process. The current Prototype Value Stream was referred to as the thirty-thousand foot view (Weingartz, 2008), presented previously in Figure 10. The thirty-thousand foot view allowed the observer to see how the company worked as a whole. What the Inputs-Process-Outputs gave was and understanding of a reduced one-thousand foot view (Weingartz, 2008). The tool that was used in the measure stage was the process map. The one-thousand foot process map quickly gave the team some manageable boundaries to scope and was previously presented in Figure 3. The beginning process step of the customer request generally originated from internal engineering or external customers such as General Motors. The customer request had typically initiated the need for a meeting between engineering and Prototype Personnel. At the conclusion of the meeting all or most of necessary inputs to begin part and material procurement had been defined and handed off to the Expediter to track. Any remaining information had typically been completed within forty-eight hours, as indicated on the Value Stream Map in Figure 10. The next process step was critical in reducing the boundaries and narrowing the scope of the project. The information that had been given to the Expediter needed to be compiled into a package and submitted to purchasing. An engineering request form and prints helped the Expediter in creating a purchase requisition form. The purchase requisition, prints and other necessary documents eventually were handed to the purchasing department in order to create a purchase order as displayed in the early process steps of Figure 3.

The purchase order was where one of the boundaries was eliminated. The thought process regarding the reduced boundaries refers to the original value stream. As documented in the value stream in Figure 10, the process steps between the original customer request and when the purchase order was issued have normally had short cycle times. Another important reason in narrowing the boundary originated from the results of the SPI. The purchase order had been issued to the supplier which began the manufacturing process or time the supplier was allotted to complete and deliver on the required due date. Recall, the delivery date on the purchase order was transferred into the Expediter parts tracking database discussed previously. The purchase order initiated the start of the tracking system which created the entry to be followed and communication to be documented, as previously present in Figure 13.

The early process steps have been defined and helped reduce the start boundary. What followed was the lengthy portion of making the requested parts. In the original process map displayed previously in Figure 3, the only process step documented was the actual Expediter follow up. In following standard Expediter training and procedure, the follow up process step required the documenting of communication in the access database tracking system and can be referenced in Figure 13. The follow up process step had continued to loop until the components were received. Nowhere in the Expediter procedures was it suggested that the parts might be received late. This was also an important step that was captured and will be discussed in detail further along. The process steps continued to move further along with the Expediter approving shipments until parts were eventually shipped. Once the parts were shipped into the Prototype Center, they were received through another access database system. The receiving system logs the incoming components and transfers them into the Expediter tracking system. Recall, the delivery date on the purchase order was transferred into the Expediter parts tracking database discussed previously. The receiving of components also became a critical find because it had helped to understand the end boundary that was to be reduced. The balance of the process steps were deemed out of scope because they had no effect on the delivery category in the Supplier Performance Index and can be compared in Figures 13 and 1. Recall that the SPI had seven categories but delivery had historically accounted for the most demerits and was the scope of the project.

Document Current Process (Reduced Boundaries)

The current thousand foot process map had been reviewed and boundaries had been reduced. The project scope had become more focused on where the problem or problems originated. The one-thousand foot process map had been reduced to a one-hundred foot process map which was previously presented in Figure 1. One other important aspect of the reduced boundaries was that it allowed more detail in which specific process steps actually occurred. The one-thousand foot process map had boundaries that narrowed to six process steps. Recall that the expanded boundaries discussed one important process step where the Expediter followed up with the supplier and that process looped until parts were received. Nowhere in the Expediter procedures was it suggested that the parts might have been received late. Nowhere in the procedures did it suggest how to escalate issues in order to have parts received on the required delivery date.

Through company training and the reference of the Value Stream, the one-thousand foot process map was created by “procedure” not what “truly” happened. The one-hundred foot process map used the boundaries discussed previously and then detailed what process steps “truly” happened. The six previous process steps of the one-thousand foot map grew in detail to thirteen process steps in the one-hundred foot map. The most notable find in the added process steps was a looping section used for escalation. No standard procedures had ever been documented but there was an undocumented process that Prototype Operations management assumed was followed and previously presented in Figure 1. The significance of the discovered escalation process links with the Expediter access tracking system as previously referenced in Figure 13. When the SPI transferred late delivery entries, the Expediter tracking system included late reasons for late shipments. These items were then categorized as engineering changes, Prototype Operations issues, supplier scheduling and incoming material certification (IMC) incomplete. Three of the four late reasons fell into the discovered escalation process that can be reviewed in Figure 13. The importance of the discovered escalation process and how the three reasons fell into that looping process will be uncovered in the analyze stage of DMAIC to follow. What was understood was that the team had finally uncovered a process map that will help determine the root cause. The thirteen process step map was reviewed once more before transitioning into the Analyze stage of DMAIC. The review was to make certain that all the desired outputs were documented above the process steps and all the necessary inputs were incorporated below the process steps.

Analyze

Analyze Current State

The Measure stage and Analyze stage of DMAIC also overlapped. The process map had been detailed to a one hundred foot process map that was used in correlation with the Failure Mode and Effect Analysis (FMEA). The process map and FMEA overlapped because they were dynamic. Any changes found in the FMEA needed to be updated to the process map. The reasoning behind choosing the FMEA as the tool was to help analyze the problem because the project did not call for the analysis of hard data. The research done on the project was transactional, not technical. One other tool that was considered was the fishbone diagram but was ruled out because it may not have given the detail needed in such a detail oriented project. All defects have a root cause, and to eliminate future defects, an action must be executed (Santos 2006). To fulfill the goal of the project, all possible problems, causes and corrective actions were analyzed. The FMEA tool was a guide to analyzing, in an organized manner, causes of possible problems (Santos 2006). The FMEA template that was used for the project included seven columns. The seven columns can be reviewed in Figure 5 and consisted of Process Step, Potential Failure Mode, Potential Failure Effects, Potential Causes, Current Controls, Actions Recommended, and Responsibility. In the FMEA study, the team needed to enter data for each of the fields corresponding with the template.

In organizing the FMEA study the first action involved gathering applicable personnel, throughout the functional organization with inputs to the process steps. In referring back to the process map in Figure 1, the inputs were reviewed and additional personnel from each of the four groups were required as resources. The four product lines follow the process map that was generated. Recall that the four product lines consisted of Hydraulics, Electronic Steering, Columns, and Driveline Systems. The Core Team already included three of the four product lines. The last product line that was not involved was Columns and a Material Coordinator was included from that group. Other members of the functional organization that were included were members from Purchasing, Product Line Managers, and various additional Expediters and Material Coordinators which can be reviewed in Figure 9. Once the resources were established, weekly meetings were arranged to generate the following data.

The following is a summary of the data integrated with the FMEA:

- Process Step: The Process step started in the order of the one-hundred foot process map that was generated. The simple question that was asked was “what was the process step” (Weingartz, 2008)?

- Potential Failure Mode: The Potential Failure mode considered each of the outputs documented above the Process step and asked “what can go wrong with the process step?" Typically when the output was reviewed the question that was asked was opposite the desired output. What caused the output to fail? The failure mode was where the bulk of the detail was documented in the FMEA (Weingartz, 2008)

- Potential Failure Effect: For each of the failure modes there was a correlating failure effect. The Potential Failure Effect asked "what was the impact on the customer (output variable) or internal requirements" (Weingartz, 2008)?

- Potential Causes: The Potential Causes referred back to the one-hundred foot process map and the inputs associated with the Potential Failure Mode. The Potential Causes asked "what are the root cause reasons for the input to go wrong?" What inputs and the reasoning made the output fail (Weingartz, 2008)?

The first four columns analyzed in the FMEA generated one-hundred eighty-eight rows of data. The team's next step was to generate some type of rating scale before the Current Controls were evaluated in the fifth column of the FMEA template under Figure 5. The rating scale set the Risk Priority Numbers through Severity, Occurrence, and Detection. Severity was associated with Potential Failure Effects, Occurrence was associated with Potential Causes, and Detection was associated with Current Controls and can be compared in Figure 5. Careful strategy was needed to set up a rating scale that would allow obvious separation between the severe few and the trivial many. Options of a rating scale typically range from three five point rating scale. The following table is an example of how Occurrence can be rated from a three to five point scale.

Occurrence scale	Occurrence scale	Occurrence scale
10-100% of the time	10-100% of the time	10- 100% of the time
5- 50% of the time	7- 50% of the time	8- 75% of the time
1- Rarely happens	4- 25% of the time	5- 50% of the time
	1- Rarely happens	3- 25% of the time

Table I An example of the separation that can be achieved in the FMEA Risk Priority Numbers. The scale chosen was the four point scale. A five point scale may have given more defined separation once the Severity, Occurrence, and Detection were multiplied out for the final RPN.

The detail related to the project led the team to believe that the four point scale would allow enough separation once the Risk Priority Numbers (RPN) were calculated. Once the scale was determined, Severity, Occurrence, and Detection had some description labeling the reasoning between why the numbers were chosen for that category. The Current Controls column was then available to be analyzed via the description given in the rating scale for detection. Once the Current Controls column was completed, Severity, Occurrence, and detection were multiplied out to calculate the

Risk Priority Number (RPN) in each row of the FMEA. Typically, the higher the RPN, the more focus that needed to be placed on the specific causes. A Pareto chart was then applied using the calculated RPNs. Multiple methods of stacking were used to help assess where the problems occurred and what was causing the problems. The Pareto chart was another tool that was used which visually helped to assign a priority of corrective actions. The first Pareto examined was stacked by process step or like process steps as shown in the following Figure 6.

Pareto of Stacked Process Steps

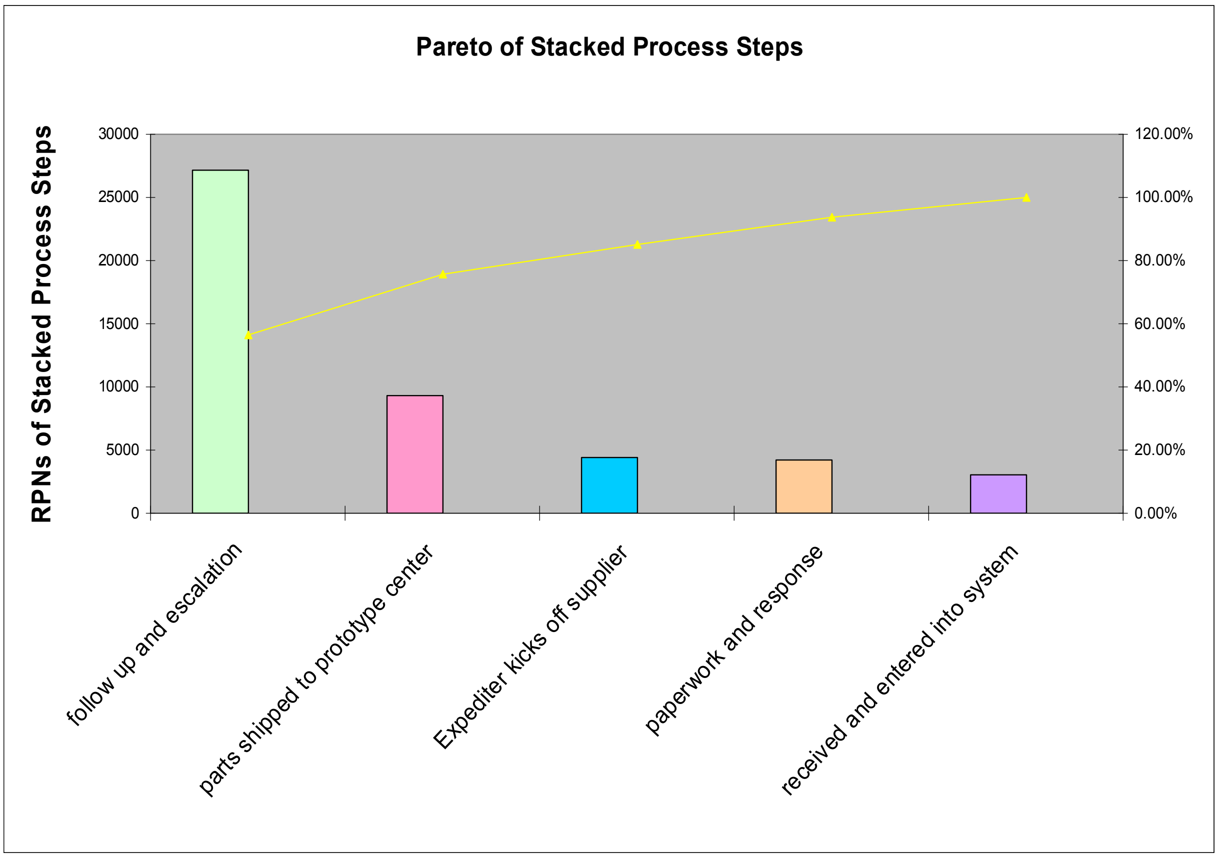


Figure 6 shows the computed Risk Priority Number for various stacked process steps in the manufacture of prototype components by Delphi Prototype Operations in Saginaw Michigan.

Of the thirteen process steps, process steps one and eleven were stand alone bars on the Pareto chart. Process steps two through eight, nine through ten, and twelve through thirteen were stacked by similarity. The two stand alone bars and the three stacked bars, by similarity, gave the five bars displayed on the Pareto chart. The reasoning behind considering the process steps was that it allowed the team to capture where the problem areas were occurring and what process steps they originated in. Most notably the first bar was associated with the escalation process that the Expediter did not have as a procedure to follow. This type of stacking gave a quick synopsis to the situation that had happened. The team had gone back to analyze the FMEA in at least one other format. The format that was most followed when analyzing the FMEA transferred the causes into the Pareto chart. The causes were reviewed and also stacked by likeness. Even with the like stacking, the Pareto chart displayed seventeen bars for review. What followed was the standard method of analyzing the FMEA (Weingartz, 2008).

Pareto of Stacked Like Causes

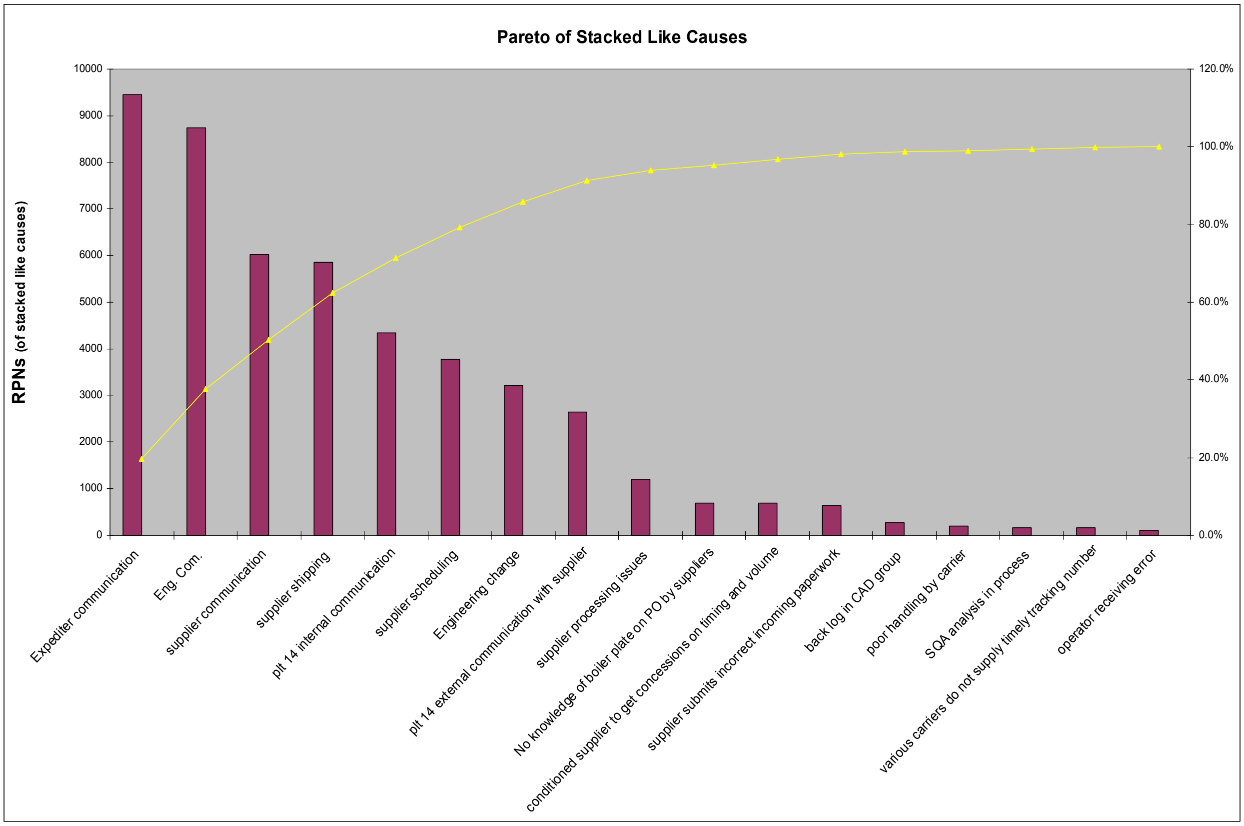


Figure 7 shows that typically the Risk Priority Numbers are categorized by causes or like causes at Delphi Prototype Operations in Saginaw Michigan.

Improve

Brainstorming Improvement

The Pareto chart by causes allowed the team to continue meeting with Prototype Operations personnel. The meetings involved brainstorm sessions and ideas to improve the causes prioritized in the Pareto chart depicted in Figure 7 from left to right. The obvious causes that were reviewed were the first four which represent nearly 80% of the overall causes. The previous Pareto chart by process step in Figure 6 was valuable because it detailed, in a statistical manner, the lack of a standardized escalation process. One method of improvement had been considered but not included until the process step Pareto chart was generated. The team had incorporated the escalation process into the future state map. The escalation process was documented and available for reference at all of the Expediter's desks.

Expediter Communication

The Expediter communication issue was captured through weekly team meetings that involved the Engineer relative to program. The future state escalation process had also addressed a trigger that Expediters could now reference. The escalation process initiated communication when parts started slipping behind originally negotiated due dates. A trigger concept was found and added. The trigger helped the Expediter to identify and escalate any issues that are suspect to parts falling behind originally scheduled delivery dates. The future state of the trigger was awareness of when to elevate the need for Core team intervention. One of the final improvements involved advocating a culture change. An organizations culture refers to the system of shared norms, beliefs, values and assumptions which bind people together, thereby creating shared meaning (F. Gray, 2006). Prototype Operations had the vision discussed previously but now incorporated slogans posted to encourage communication such as "when it might be late don't wait". On-time delivery is directly related to quality. Prototype Operations has had a quality slogan labeled "eyes for quality". "Eyes for delivery" had also been incorporated as part of the slogan to help encourage all involved in the process. A culture change or moral boost was especially needed due to the tough economic time in late 2008.

Engineering Communication

Engineering communication was the next cause that was reviewed on the Pareto chart. The project sponsor took the liberty to undertake this issue. Recall that there were four product lines at Prototype Operations. The Driveline Systems group has had the best success in communicating with Product Engineering to help bring issues back into control. The success was accounted by training that was completed directly to the Driveline group. The training consisted of sixty-nine slide, three hour session to teach engineers just how the part order process is accomplished and how engineering's input was important. The training that the Driveline group received in the past had been fine tuned to help make applicable to all product lines and presented to the remaining groups.

Supplier Communication

Supplier communication had been brainstormed with two outcomes. The first fell into the escalation process discussed previously. Some areas of improvement were directly affected due to the new escalation process. The second improvement outcome presented the need for a standardized communications method. What the team had brainstormed through meetings was a method that would not only help reduce the number of times a supplier was contacted but improve the quality of the responses. The Expediter tracking system, previously presented in Figure 13, gave quantities of current orders per supplier. Those quantities were compiled into an email-communication that required the response of each supplier. Every Friday morning before 9:00 a.m. the PC&L manager sent out a generated list of open orders of which the suppliers were given a Monday morning 9:00 a.m. deadline to respond. This email allowed the suppliers to view each specific order due and understand where their respective organization fell relative to the due dates. The email also helped negate the volume of telephone calls to the suppliers by the Expediters in the building. The email allowed focus for the supplier without interruption and focus for the Expediter to escalate as needed per the responses given. Although the system was a manual system it did bear similarity to the improvement process that was researched by Hickman et al., 2007.

Supplier Shipping

The final cause that was addressed was supplier shipping. Prototype Operations never had any packaging specifications to offer suppliers. As a result, packages were often lost, received late, or damaged upon receipt. The PC&L manager had taken the liberty to improve this issue by creating packaging specifications that were emailed with purchase orders when the parts to be manufactured had begun. As part of the Expediter follow up process, confirmation that the supplier received the purchase order also entailed the Expediter to confirm the receipt of the packaging specs.

<u>Control</u>

Robust Corrective Actions

The improvement methods were discussed in the Improve stage of DMAIC previously. The results of the corrective actions have been successful but will continue to be evaluated for improvement. Approximately 85% of prototype business was getting the parts received on the required due date. The goal of the project had stated that there had always been a 5-9% late delivery of parts which drove premium shipping costs. A 50% reduction of late deliveries had been targeted. As of March 2009 the PC&L manager had witnessed the late deliveries percentage reduced down to 1-2%. The current measure was reduced approximately 70%. As the project was being evaluated some fine tuning of current practices along with the main priorities assessed in the Pareto chart helped to reduce the percentages. The following is a outline of improvements made along with controls that were assigned.

I. Expediter Communication

1) Incorporating the standardized method of escalation to the individual groups but focused to Expediters.
    a. **Control:** Weekly Material Coordinator review
    b. **Control:** Yearly skills matrix evaluation.

2) Trigger of awareness and when to elevate the need for Core Team intervention.
    a. **Control:** Weekly Material Coordinator review
    b. **Control:** Yearly skills matrix evaluation.

3) Culture change to help think “when it might be late don’t wait” and “eyes for delivery”.
    a. **Control:** Posted slogans that are easily viewable as a constant reminder.
    b. **Control:** It will also be reviewed in the year skills matrix audit.

4) Mandatory program meetings between Engineering and Core Team when parts are being manufactured and assembled at Prototype Operations.
    a. **Control:** Control will be dependent on whether a program is currently being followed but reviewed by the Product Line Manager and Engineering when applicable.

II. Engineering Communication

1) Engineering training presented by the plant manager to all groups in product engineering.
    a. **Control:** Control will be assessed as part of the yearly internal customer survey addressed to Engineering.

2) Mandatory program meetings between Engineering and Core Team when parts are being manufactured and assembled at Prototype Operations.
    a. **Control:** Control will be dependent on whether a program is currently being followed but reviewed by the Product Line Manager and Engineering when applicable.

III. Supplier Communication

1) Incorporating the standardized method of escalation to the individual groups but focused to Expediters.
   a. **Control:** Weekly Material Coordinator review
   b. **Control:** Yearly skills matrix evaluation.

2) Twenty-four hour response time on compiled open orders sent Friday morning at 9:00 with a response due by Monday morning 9:00.
   a. **Control:** Weekly Material Coordinator review
   b. **Control:** Yearly skills matrix evaluation.
   c. **Control:** A no response or poor response will be addressed in the weekly quality meetings.

IV. Supplier Shipping

1) Packaging specs created by the PC&L manager and sent out by Expediters when calling to confirm receipt of purchase orders.
   a. **Control:** Debits will be submitted to suppliers if a non-conformance causes parts to be late or not usable.

Conclusion and Recommendations

As discussed previously, the result of the project was successful. A target goal of reducing late deliveries by 50% was achieved and exceeded. This reduction can be compared when viewing the Supplier Performance Index (SPI) from January 1st 2008 through December 31st 2008 under figure 12 and the current measure from January 1st 2009 through March 31st 2009 given by the PC&L manager. During the life of the project, the escalation portion was found early during mapping of the future state. Once this portion was found, it was evident that a milestone was achieved. An early February update to the Prototype Operations staff members had made them aware of the non-standardized method of escalation. Most Expediters did not possess the awareness of when to pull the trigger and escalate issues of potential late delivery. The trigger transferred the communication to the necessary personnel and helped resolve the issues. Formal methods of awareness within the group began the improvement process. This formal process was similar to the more formal methods of control researched by the Pernot, et al., 2008 case study.

Problems within the project occurred from the start when a predetermined improvement skewed the problem solving strategy. The tracking system that OEM (GM or Ford) companies used was thought to be the fix for Prototype Operation suppliers. Once the current state map was followed accurately, the greater cause to the problem was found and involved an internal process improvement. Other issues may have skewed the metrics when comparing the 2008 baseline measure with 2009. The volume of components ordered had significantly been reduced and productivity decreased which was not related to this project. Another handicap related to this project involved the lack of available local suppliers. Prototype Operations had access to hundreds of suppliers worldwide but the small amount locally left little means to enforce a reduction of work or debit of finances due to the fear of losing a supplier. The cost savings in shipping were left out because too many variables were skewing the costs. The volume change of shipments between 2008 and 2009 presented the most difficult comparison in the cost savings.

A recommendation for further work would include the transfer of the access database into web format. One of the causes on the Pareto chart suggested that a better means of communication was needed. An improvement was implemented in using a weekly open order email that was sent out to suppliers Friday morning at 9:00 a.m. and required a response by Monday 9:00 a.m. The idea of having a tracking system similar to the OEM companies did not calculate to the main problem. However, the tracking system did summarize as part of the communication problem. Once the web based data system is available, the manual response method could be improved. Recommendations towards a different approach may have involved other tools to help find the solution. As mentioned previously in the Analyze portion of the paper, another approach may have involved using a fishbone diagram rather than the FMEA. The original thought was that because of the detail in the process, an FMEA would be needed to capture the detail. A fishbone diagram or 5-why strategy may have also achieved similar results. The issue of cost savings will need more time to have more data towards a better comparison.

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Appendices

Figure 1

100ft Future State Map (reduced boundaries)

Note: Figure 1 and 13 coincide. This was a dynamic tracking system used by the Expediters at Delphi Prototype Operations and captured any communication with supplier and engineering. The promise date was within the control of the Expediter and drove the reasoning listed below in categories (1) through (4). These categories are road mapped in Figure 1 to show correlation.

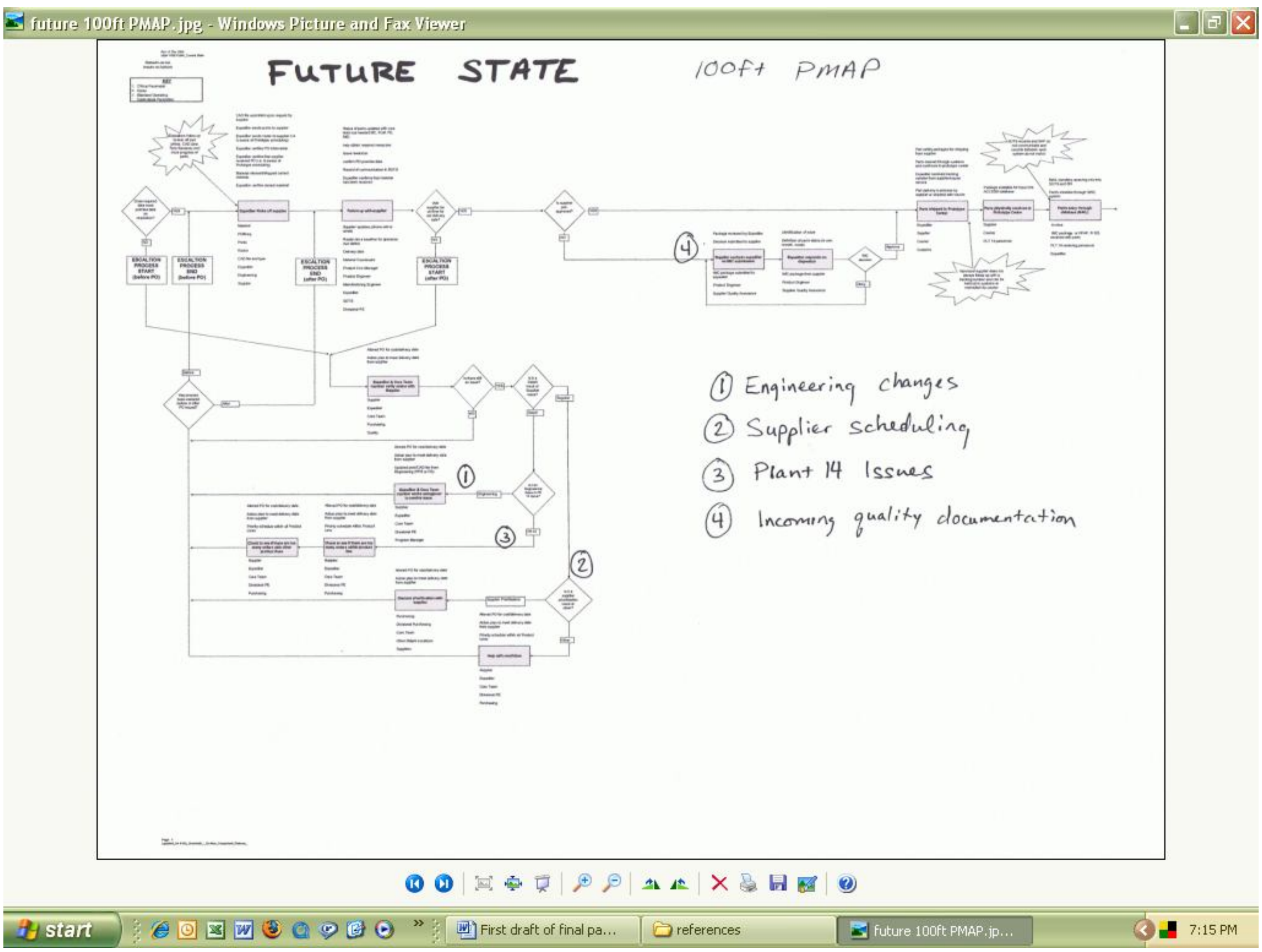


Figure 2

Thought Map

Note: Only the Define, Measure and Analyze stages are displayed. The figure is given to show the thought process and the various stages of transitioning between DMAIC. For each stage a question, answer and action was taken similar to how a 5-why works. An output/action was a catalyst to a new input/question.

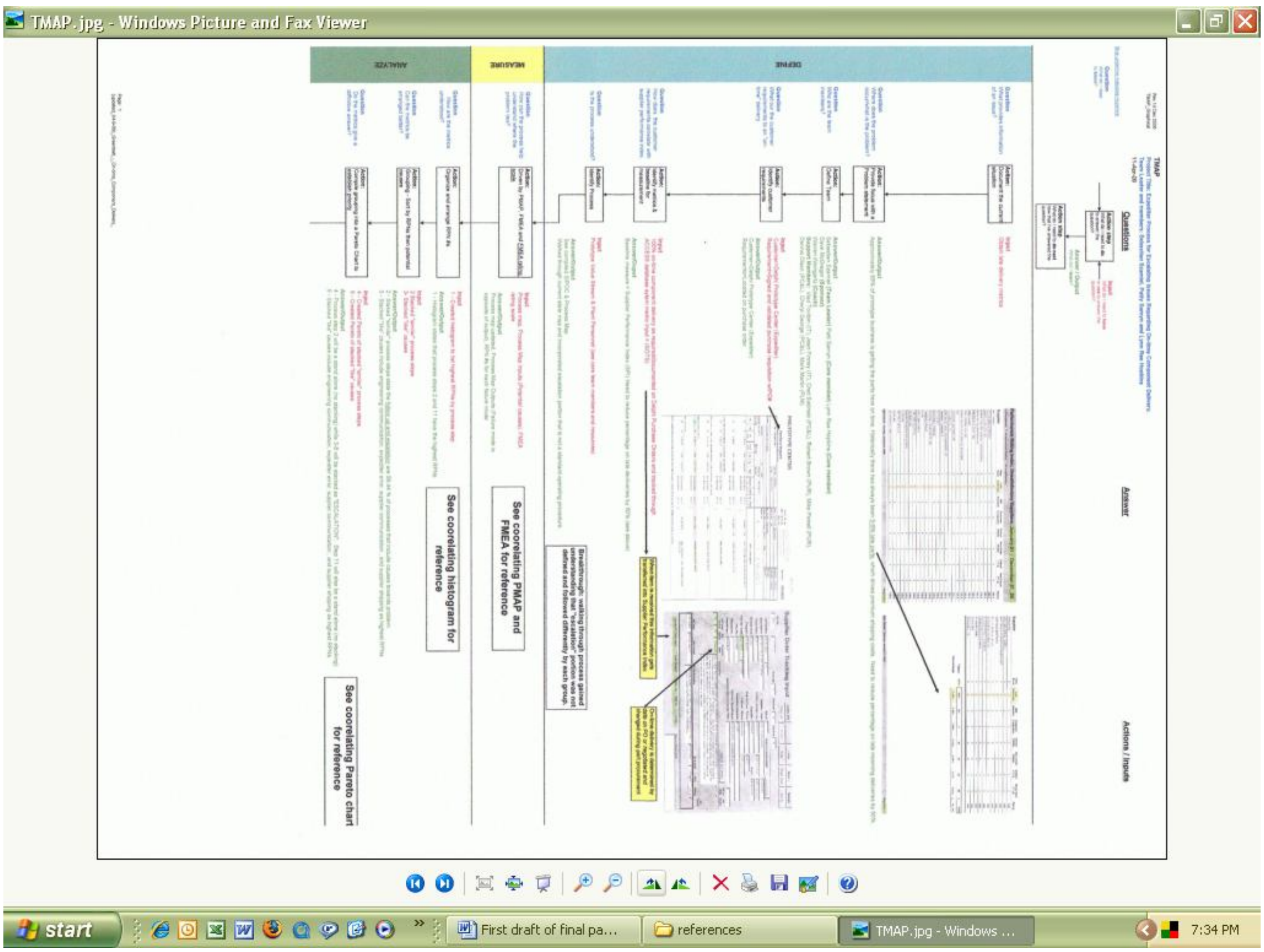


Figure 3

1000ft Current State Map (expanded boundaries). The original Current state mapping was directed by “procedure” not how the process “truly” was followed.

See Figure 1 for 100ft Future State Map (reduced boundaries) which represented the “true” process and eventually standardized between the organization.

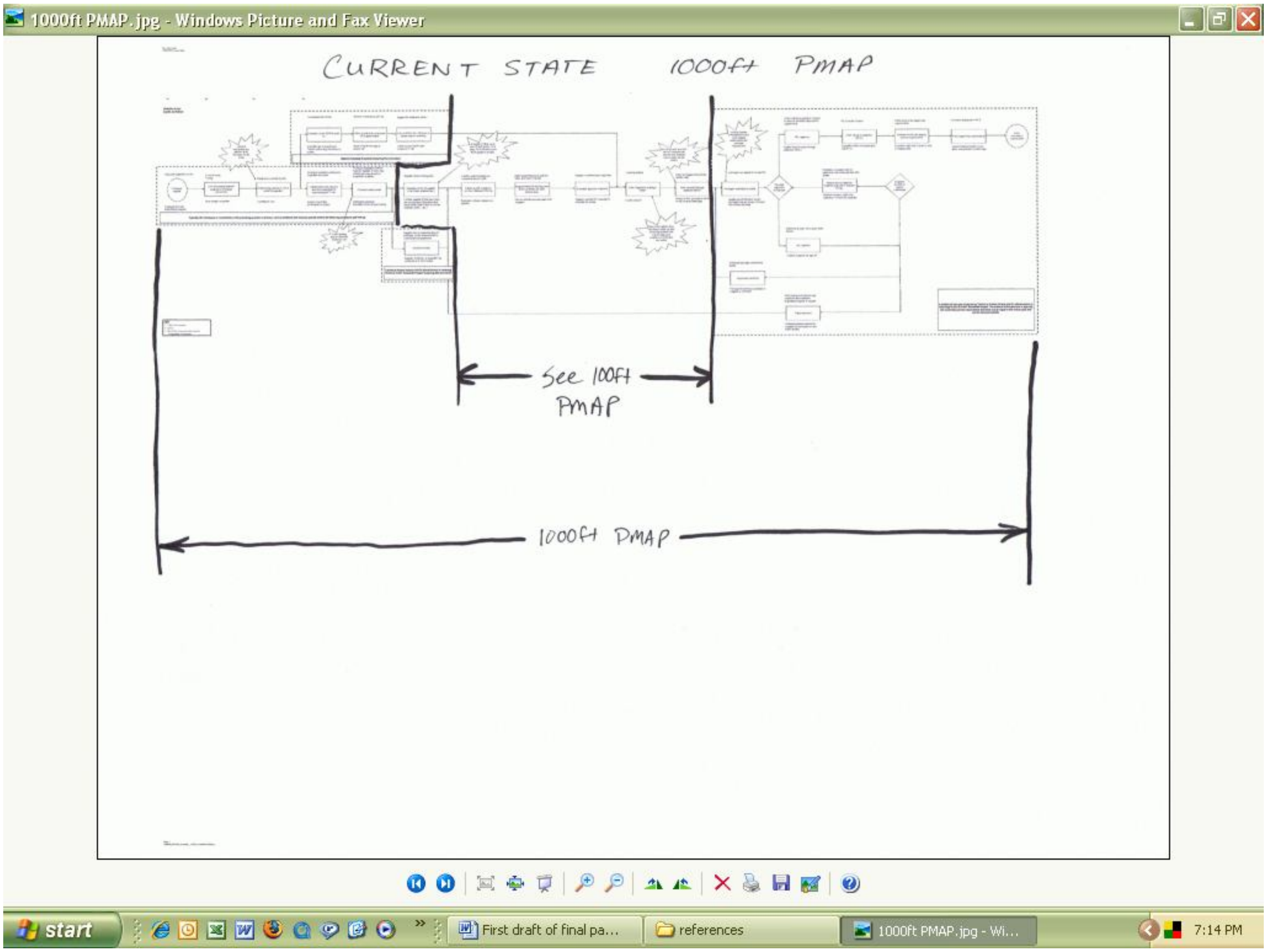


Figure 4

The section highlighted in red details the portion of the Value stream that the Project is focusing on.

Note the simplicity compared to the actual process in Figure 1

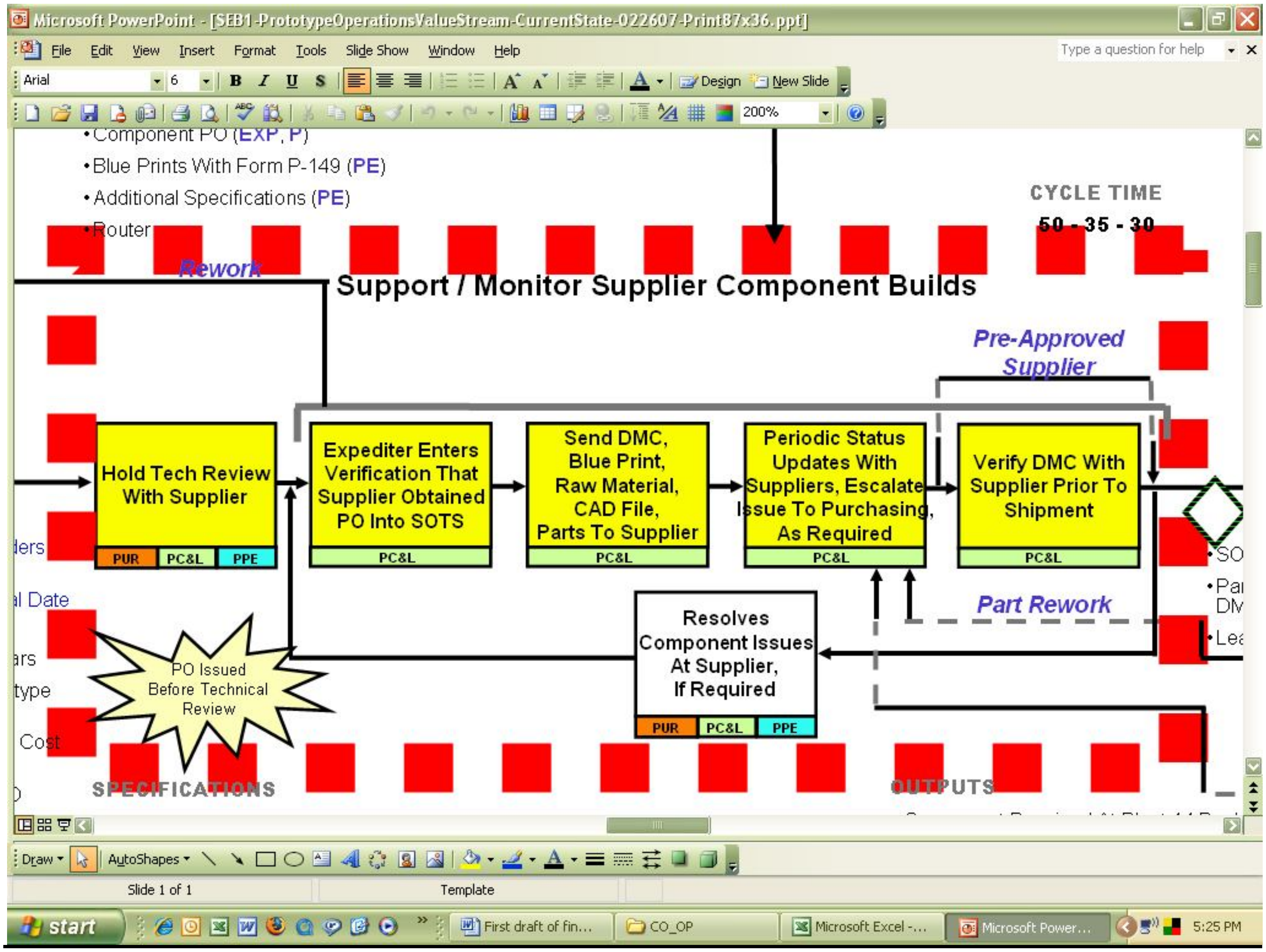
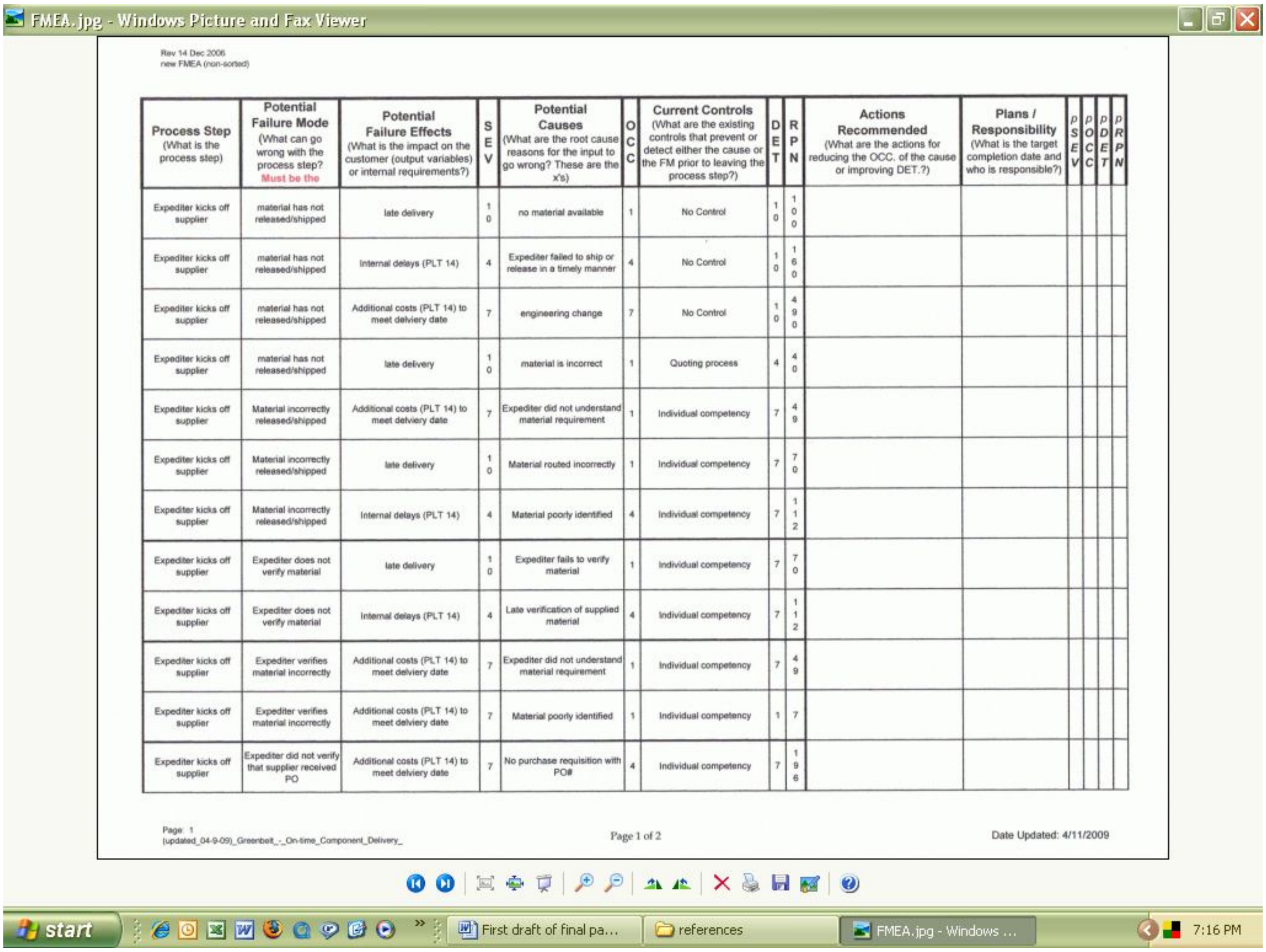


Figure 5

FMEA – The example below shows the first page (12 of 188 rows) of the FMEA table (first process steps) with RPNs. Figure 8 can be referenced for FMEA rating scale which produced the RPN column.



Rev 14 Dec 2006
new FMEA (non-sorted)

Process Step (What is the process step)	Potential Failure Mode (What can go wrong with the process step? Must be the	Potential Failure Effects (What is the impact on the customer (output variables) or internal requirements?)	SEV	Potential Causes (What are the root cause reasons for the input to go wrong? These are the x's)	OCC	Current Controls (What are the existing controls that prevent or detect either the cause or the FM prior to leaving the process step?)	DET	RPN	Actions Recommended (What are the actions for reducing the OCC. of the cause or improving DET.?)	Plans / Responsibility (What is the target completion date and who is responsible?)	p SEV	p OCC	p DET	p RPN
Expediter kicks off supplier	material has not released/shipped	late delivery	10	no material available	1	No Control	10	100						
Expediter kicks off supplier	material has not released/shipped	Internal delays (PLT 14)	4	Expediter failed to ship or release in a timely manner	4	No Control	10	160						
Expediter kicks off supplier	material has not released/shipped	Additional costs (PLT 14) to meet delviery date	7	engineering change	7	No Control	10	490						
Expediter kicks off supplier	material has not released/shipped	late delivery	10	material is incorrect	1	Quoting process	4	40						
Expediter kicks off supplier	Material incorrectly released/shipped	Additional costs (PLT 14) to meet delviery date	7	Expediter did not understand material requirement	1	Individual competency	7	49						
Expediter kicks off supplier	Material incorrectly released/shipped	late delivery	10	Material routed incorrectly	1	Individual competency	7	70						
Expediter kicks off supplier	Material incorrectly released/shipped	Internal delays (PLT 14)	4	Material poorly identified	4	Individual competency	7	112						
Expediter kicks off supplier	Expediter does not verify material	late delivery	10	Expediter fails to verify material	1	Individual competency	7	70						
Expediter kicks off supplier	Expediter does not verify material	Internal delays (PLT 14)	4	Late verification of supplied material	4	Individual competency	7	112						
Expediter kicks off supplier	Expediter verifies material incorrectly	Additional costs (PLT 14) to meet delviery date	7	Expediter did not understand material requirement	1	Individual competency	7	49						
Expediter kicks off supplier	Expediter verifies material incorrectly	Additional costs (PLT 14) to meet delviery date	7	Material poorly identified	1	Individual competency	1	7						
Expediter kicks off supplier	Expediter did not verify that supplier received PO	Additional costs (PLT 14) to meet delviery date	7	No purchase requisition with PO#	4	Individual competency	7	196						

Page: 1
(updated_04-9-09)_Greenbelt_-_On-time_Component_Delivery_

Page 1 of 2

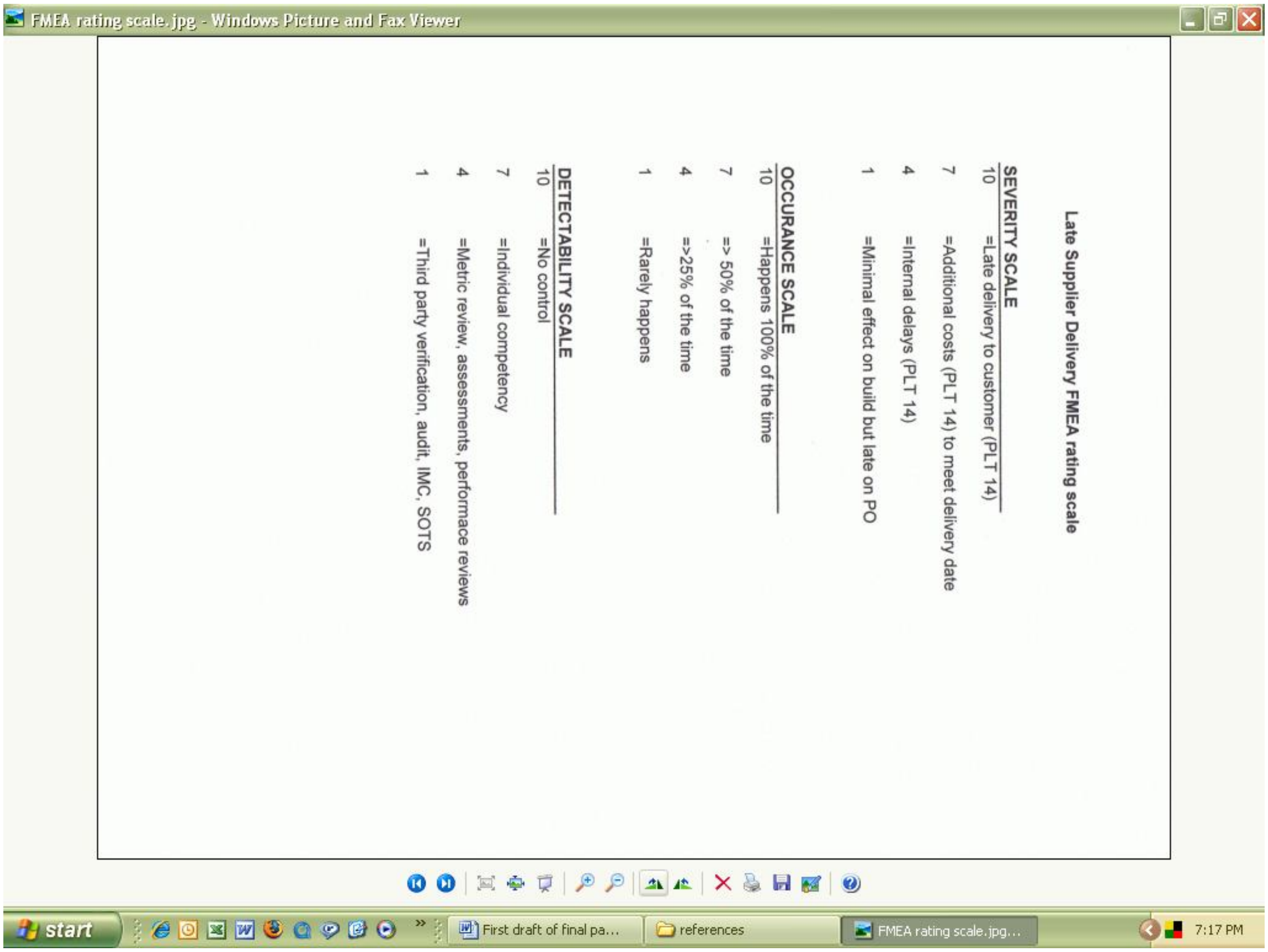
Date Updated: 4/11/2009

Note: Figure 6 (pg 13) and 7 (pg 14) is within the text of the document

Figure 8

FMEA rating scale used to assess various risks for component deliveries at Delphi Prototype Operations, Saginaw Michigan

The rating scale used refers to a 4 point scale.



Late Supplier Delivery FMEA rating scale

SEVERITY SCALE

10 =Late delivery to customer (PLT 14)

7 =Additional costs (PLT 14) to meet delivery date

4 =Internal delays (PLT 14)

1 =Minimal effect on build but late on PO

OCCURANCE SCALE

10 =Happens 100% of the time

7 => 50% of the time

4 =>25% of the time

1 =Rarely happens

DETECTABILITY SCALE

10 =No control

7 =Individual competency

4 =Metric review, assessments, performace reviews

1 =Third party verification, audit, IMC, SOTS

Figure 9

Figure 9 gives an example of Delphi Prototype Operations as a functional organization (F. Gray 2006). Each group has direct input into the Company Value Stream. Each of the groups listed below gave direct input to the process when the FMEA was being compiled.

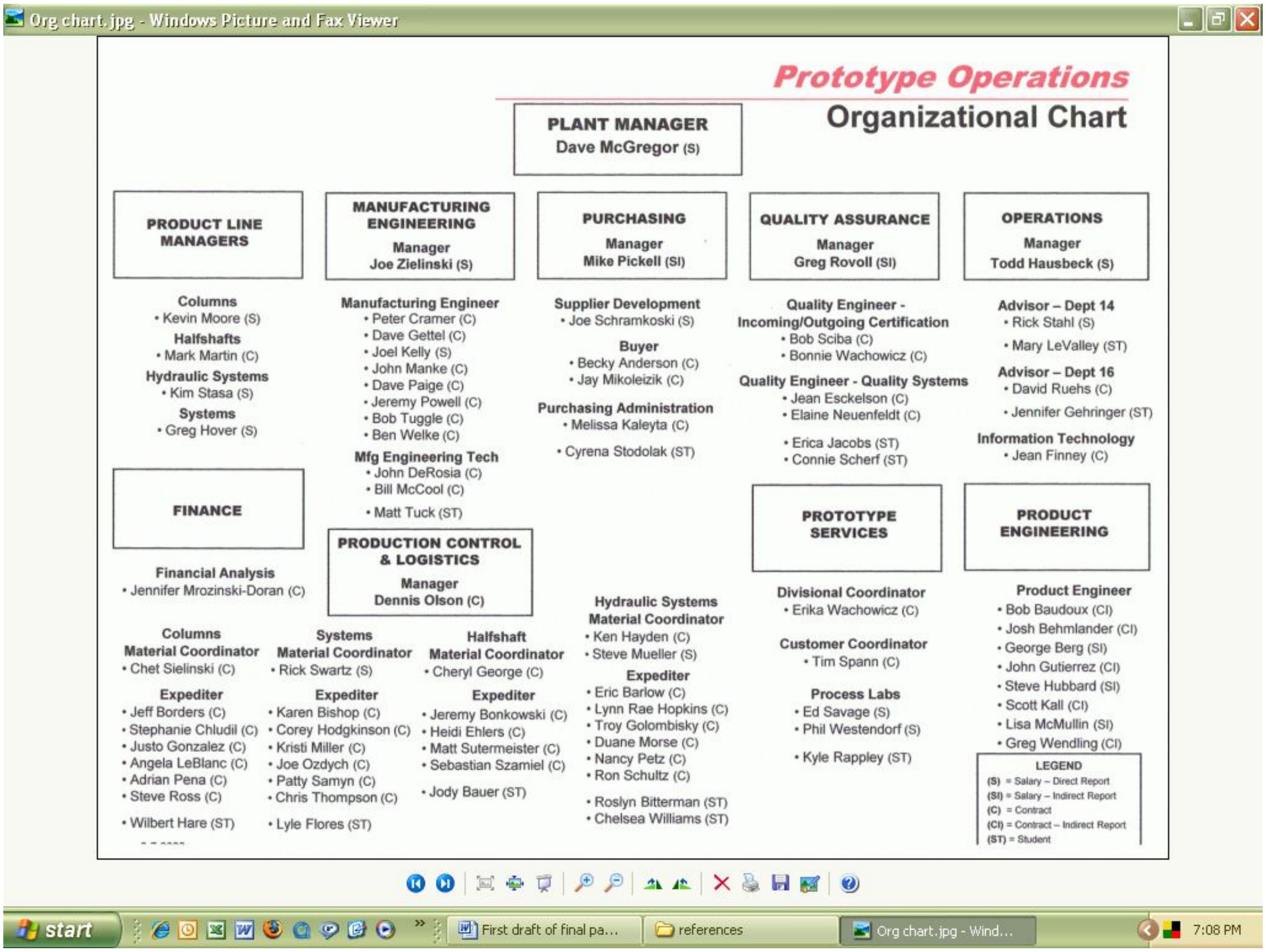


Figure 10

Below the detail of the Delphi Prototype Operations Value Stream is given: The detail shows actual process steps, inputs and outputs required by applicable groups of the organization to successfully produce the end product and service.

See Figure 4 for the section highlighted in red detailing the portion of the Value stream that the Project is focusing on.

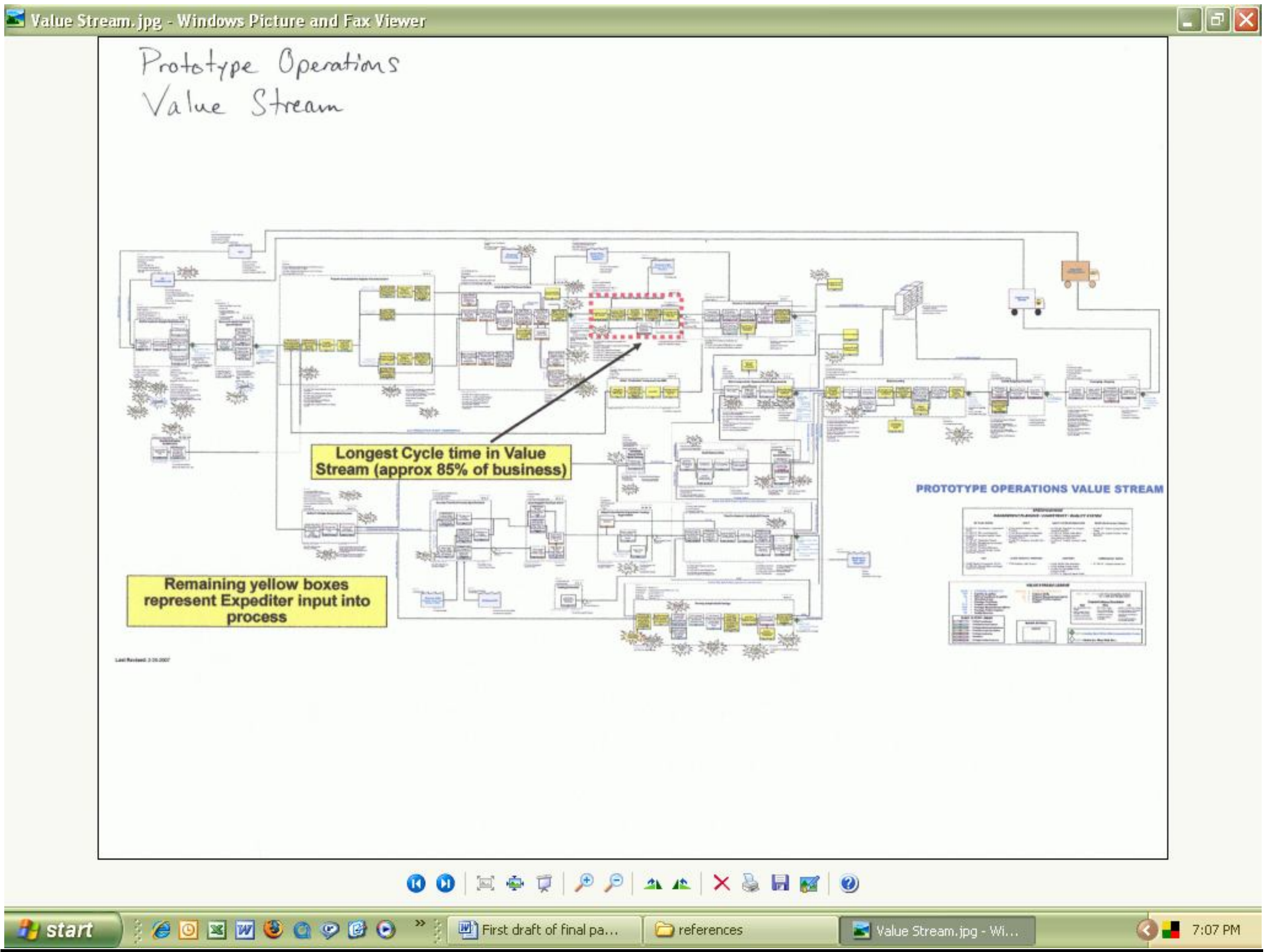
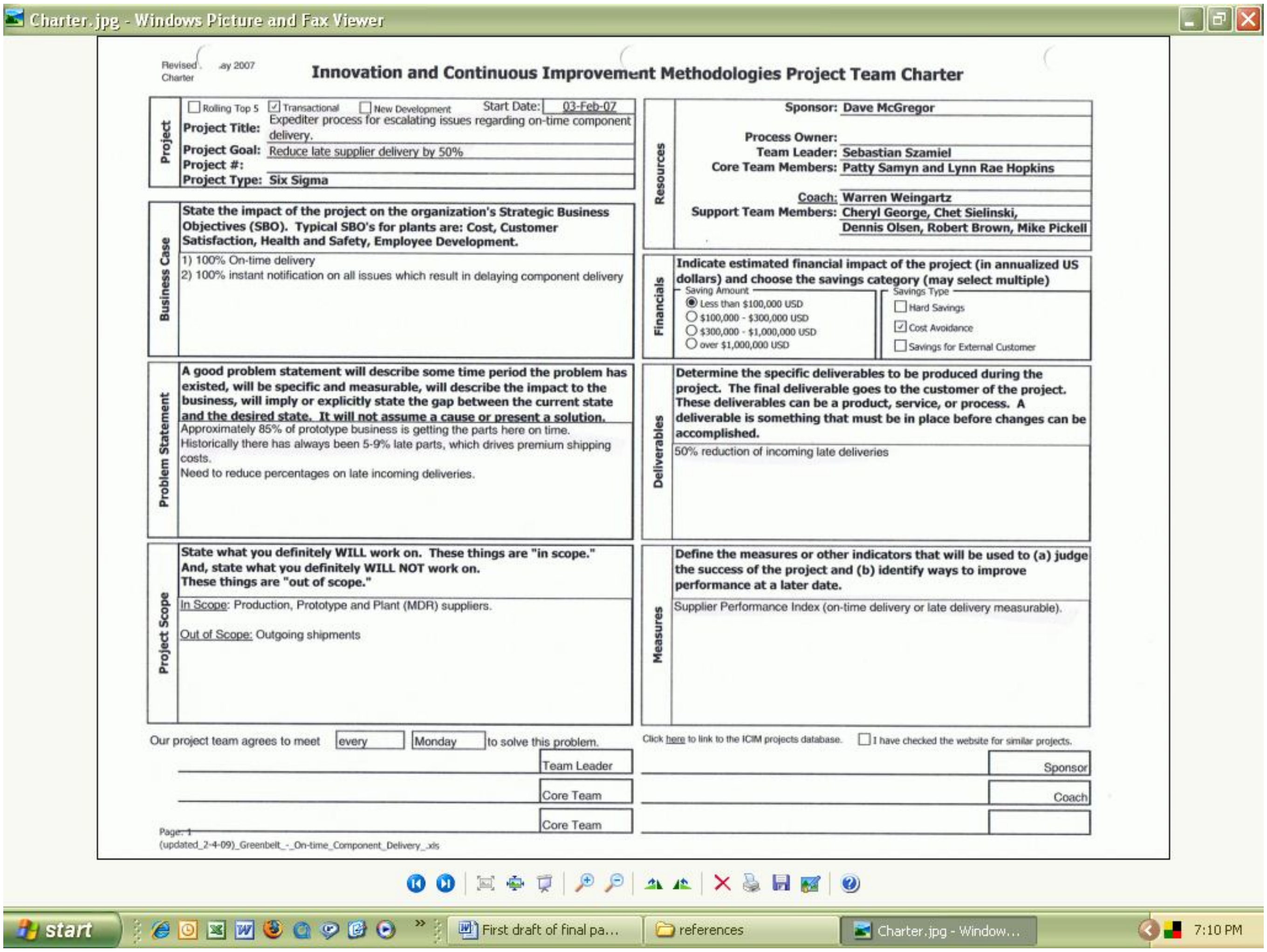


Figure 11

The “Expediter Process for Escalating Issues Regarding On-Time Component Delivery” Project Charter was a document that captured various definitions of the project as well as an important reference tool.


Charter.jpg - Windows Picture and Fax Viewer

Revised May 2007
Charter

Innovation and Continuous Improvement Methodologies Project Team Charter

Project

☐ Rolling Top 5 ☑ Transactional ☐ New Development Start Date: 03-Feb-07

Project Title: Expediter process for escalating issues regarding on-time component delivery.

Project Goal: Reduce late supplier delivery by 50%

Project #:

Project Type: Six Sigma

Resources

Sponsor: Dave McGregor

Process Owner:

Team Leader: Sebastian Szamiel

Core Team Members: Patty Samyn and Lynn Rae Hopkins

Coach: Warren Weingartz

Support Team Members: Cheryl George, Chet Sielinski, Dennis Olsen, Robert Brown, Mike Pickell

Business Case

State the impact of the project on the organization's Strategic Business Objectives (SBO). Typical SBO's for plants are: Cost, Customer Satisfaction, Health and Safety, Employee Development.

1) 100% On-time delivery
2) 100% instant notification on all issues which result in delaying component delivery

Financials

Indicate estimated financial impact of the project (in annualized US dollars) and choose the savings category (may select multiple)

Saving Amount
◉ Less than $100,000 USD
○ $100,000 - $300,000 USD
○ $300,000 - $1,000,000 USD
○ over $1,000,000 USD

Savings Type
☐ Hard Savings
☑ Cost Avoidance
☐ Savings for External Customer

Problem Statement

A good problem statement will describe some time period the problem has existed, will be specific and measurable, will describe the impact to the business, will imply or explicitly state the gap between the current state and the desired state. It will not assume a cause or present a solution.

Approximately 85% of prototype business is getting the parts here on time.
Historically there has always been 5-9% late parts, which drives premium shipping costs.
Need to reduce percentages on late incoming deliveries.

Deliverables

Determine the specific deliverables to be produced during the project. The final deliverable goes to the customer of the project. These deliverables can be a product, service, or process. A deliverable is something that must be in place before changes can be accomplished.

50% reduction of incoming late deliveries

Project Scope

State what you definitely WILL work on. These things are "in scope." And, state what you definitely WILL NOT work on. These things are "out of scope."

In Scope: Production, Prototype and Plant (MDR) suppliers.

Out of Scope: Outgoing shipments

Measures

Define the measures or other indicators that will be used to (a) judge the success of the project and (b) identify ways to improve performance at a later date.

Supplier Performance Index (on-time delivery or late delivery measurable).

Our project team agrees to meet every Monday to solve this problem.

Click here to link to the ICIM projects database. ☐ I have checked the website for similar projects.

Team Leader | Sponsor
Core Team | Coach
Core Team

Page 1
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start | First draft of final pa... | references | Charter.jpg - Window... | 7:10 PM

Figure 12

Supplier Performance Index (SPI)

Note: The first and last page was copied as an example. In this SPI, the seven categories discussed previously can be reviewed. The highlighted late deliveries column was the only focus of the group. The January 1st 2008 through December 31st 2008 dates display the late metric at **7.46%.** January 1st 2009 through March 29th 2009 metrics were verbally provided by the PC&L manager and were said to be between 1-2%.

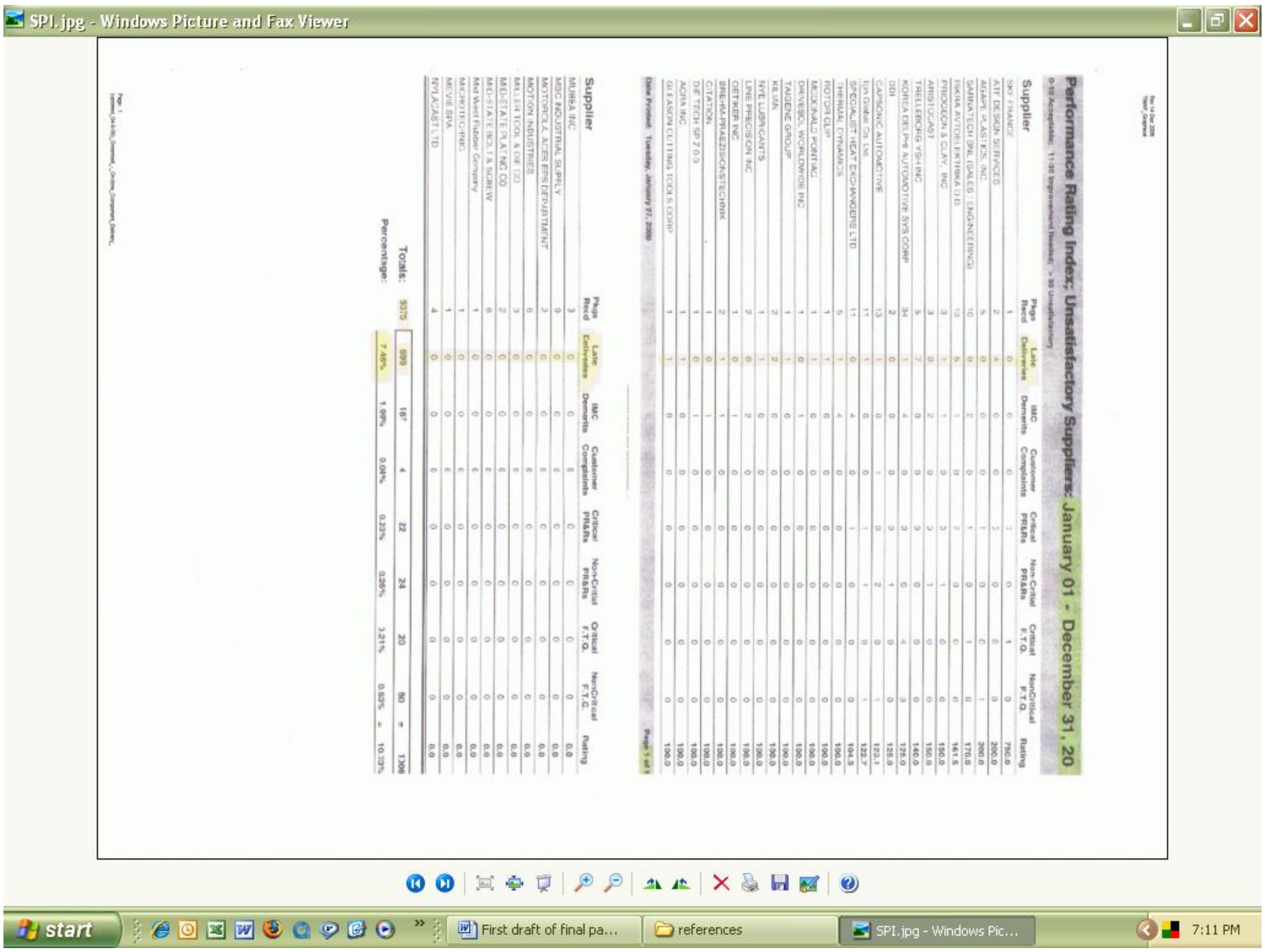
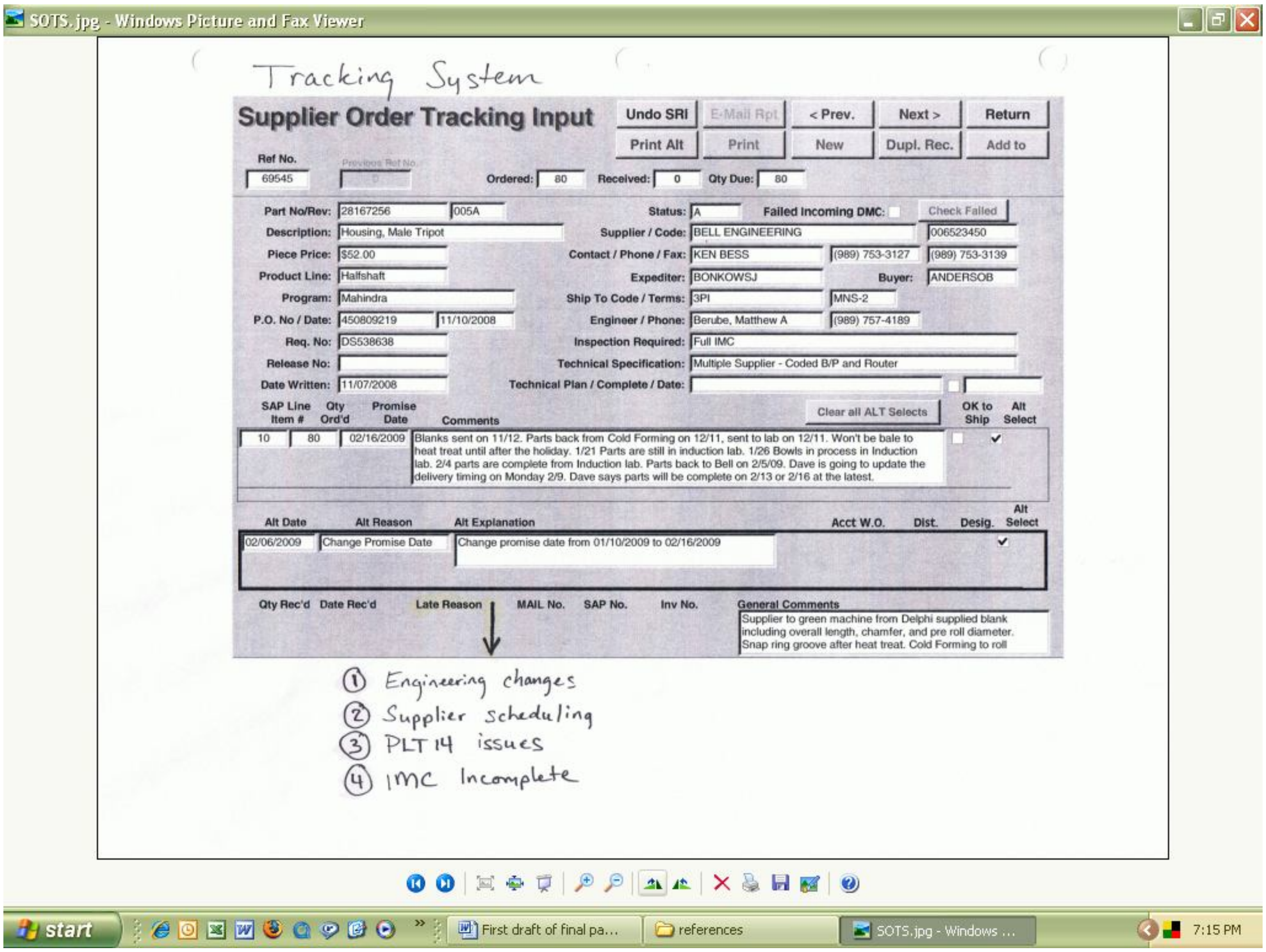


Figure 13

Note: Figure 1 and 13 coincide. This was a dynamic tracking system used by the Expediters at Delphi Prototype Operations and captured any communication with supplier and engineering. The promise date was within the control of the Expediter and drove the reasoning listed below in categories (1) through (4). These categories are road mapped in Figure 1 to show correlation.



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Tracking System

Supplier Order Tracking Input

Undo SRI | E-Mail Rpt | < Prev. | Next > | Return
Print Alt | Print | New | Dupl. Rec. | Add to

Ref No.: 69545 | Previous Ref No.: 0 | Ordered: 80 | Received: 0 | Qty Due: 80

Part No/Rev:	28167256 005A	Status:	A
Description:	Housing, Male Tripot	Supplier / Code:	BELL ENGINEERING 006523450
Piece Price:	$52.00	Contact / Phone / Fax:	KEN BESS (989) 753-3127 (989) 753-3139
Product Line:	Halfshaft	Expediter:	BONKOWSJ Buyer: ANDERSOB
Program:	Mahindra	Ship To Code / Terms:	3PI MNS-2
P.O. No / Date:	450809219 11/10/2008	Engineer / Phone:	Berube, Matthew A (989) 757-4189
Req. No:	DS538638	Inspection Required:	Full IMC
Release No:		Technical Specification:	Multiple Supplier - Coded B/P and Router
Date Written:	11/07/2008	Technical Plan / Complete / Date:	

Failed Incoming DMC: | Check Failed | Clear all ALT Selects

SAP Line Item #	Qty Ord'd	Promise Date	Comments	OK to Ship	Alt Select
10	80	02/16/2009	Blanks sent on 11/12. Parts back from Cold Forming on 12/11, sent to lab on 12/11. Won't be bale to heat treat until after the holiday. 1/21 Parts are still in induction lab. 1/26 Bowls in process in Induction lab. 2/4 parts are complete from Induction lab. Parts back to Bell on 2/5/09. Dave is going to update the delivery timing on Monday 2/9. Dave says parts will be complete on 2/13 or 2/16 at the latest.		✔

Alt Date	Alt Reason	Alt Explanation	Acct W.O.	Dist.	Desig.	Alt Select
02/06/2009	Change Promise Date	Change promise date from 01/10/2009 to 02/16/2009				✔

Qty Rec'd	Date Rec'd	Late Reason	MAIL No.	SAP No.	Inv No.	General Comments
						Supplier to green machine from Delphi supplied blank including overall length, chamfer, and pre roll diameter. Snap ring groove after heat treat. Cold Forming to roll

(1) Engineering changes
(2) Supplier scheduling
(3) PLT 14 issues
(4) IMC Incomplete

start | First draft of final pa... | references | SOTS.jpg - Windows ... | 7:15 PM

Note: Figure 14 (pg 9) is displayed within the text of the document