

COMPUTER INTEGRATED MANUFACTURING

Needs Assessment

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October, 1994

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EXECUTIVE SUMMARY

- OCC's Computer Integrated Manufacturing Program has experienced declining enrollments in recent years. Advanced level courses are often canceled due to low enrollments; many students who enroll in the introductory CIM course transfer to the CAD or Robotics program after the first semester.
- Computer Integrated Manufacturing is not offered as a self-contained program at any other southeastern Michigan community college, although several schools teach CIM concepts in CAD/CAM, Manufacturing Engineering, or Computer Numerical Control programs.
- While many employers do not find new hires adequately trained in CIM, the majority prefer to provide on-site training led by other company employees. This choice appears to be driven by the necessity of staying abreast of industry developments, a task which employers feel they are better equipped to handle than a community college or vo-tech program.
- The vast majority of employers anticipate that their need for employees with CIM training will increase in coming years. None of the employers surveyed predicted that needs would decrease from the current level.
- While all of the skill areas covered in the current CIM program are rated important by at least a third of employers surveyed, CNC and CAD/CAM skills received the highest ratings.
- The majority of students surveyed are working full-time in a position closely related to their CIM coursework. While most were generally satisfied with the program, over half felt that more CAD/CAM courses would have been of use to them. The most common suggestion for improving the program is the integration of more "hands-on" courses.
- Finally, a real need exists in the workplace for CIM-trained employees. The challenge for OCC's CIM program lies in identifying these needs and modifying the program to meet them. The ability to remain flexible and the capacity to stay up to date in the face of rapidly changing technology will be crucial.

**Computer Integrated Manufacturing
Needs Assessment
Oakland Community College**

INTRODUCTION

The purpose of this report is to evaluate the Computer Integrated Manufacturing (CIM) program in light of current employer needs and industry trends. This report is designed to identify the current needs of employers while addressing the issue of declining enrollment in the CIM program.

This report incorporates a review of related literature, employment statistics (provided by The Occupational Outlook Handbook, Michigan Employment Security Commission, and the Michigan Occupational Information System) as well as information supplied by employers, OCC students, and professional associations. In addition, program coordinators and faculty members involved with similar programs at other institutions were contacted.

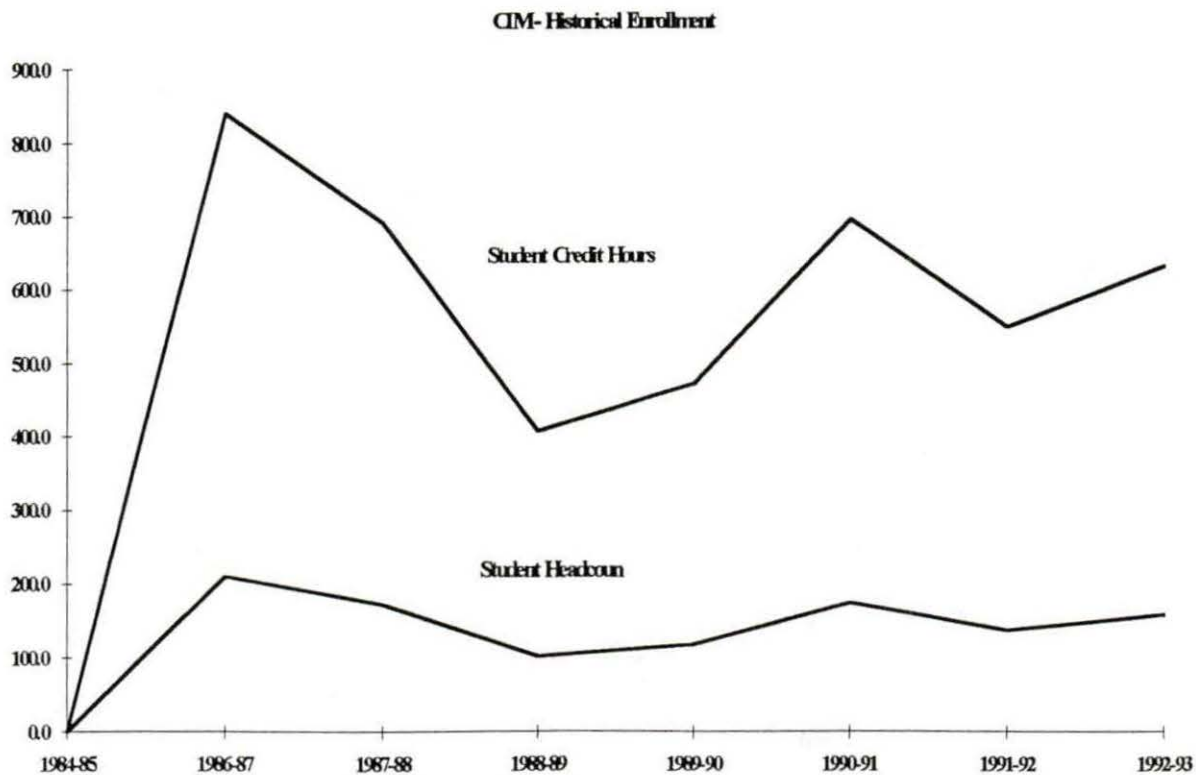
Description of Existing Program

Currently, OCC's CIM program leads to an associate degree in Applied Science. Computer Integrated Manufacturing is based upon the concept of the totally automated factory in which all manufacturing is controlled by a CAD/CAM system. In addition to the CIM core courses, students are required to enroll in courses in Computer Aided Design, Robotics, Machine Tool Technology, and Electronics Technology. The program description states that by "utilizing various machine-type controllers and/or industrial computers, the student will gain skills in the basic concepts of Computer Integrated Manufacturing which comprise the basis of the factory of the future." In the past, many of those enrolled in CIM courses were also employed in the field. Many were sent to the CIM program by employers in order to improve on-the-job knowledge and skills. Recently, however, enrollment in OCC CIM courses has declined. Faculty feel that this is in large part due to a declining number of employers who opt to send employees to OCC for CIM training.

The enrollment decline of recent years has often necessitated the cancellation of advanced level courses. CIM 110, 230 and 240 have always been offered, but many of the upper-level courses do not attract sufficient numbers of students and are often canceled. Recently, CIM 240 was canceled for the first time due to low enrollments. Furthermore, many students who enroll in the introductory course (CIM 110) drop out or transfer to the CAD or Robotics program. Since 1987, just four associate degrees and one certificate have been awarded in the program. The decline in student headcount and credit hours over the past nine years is depicted below:

Table 1
Annual Student Credit Hours and Duplicated Headcount

	1984-85	**	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	Percent Change	
	SCH		SCH	SCH	SCH	SCH	SCH	SCH	SCH	5- Year	10- Year
Student Credit Hours	0.0		840.0	692.0	408.0	472.0	696.0	548.0	692.0	54.9	-
Student Headcount	0	**	210	173	102	118	174	137	158	54.9	-



In response to declining enrollments, faculty and administrators are looking to reshape the CIM program to make it more attractive to students and employers alike. One option is to incorporate a greater number of CAD/CAM courses, as many first-time CIM students end up transferring into the CAD program. According to faculty members, local industries are currently looking for employees with design experience. Faculty members feel that modifying the CIM program to include more of these courses could potentially enhance the employability of graduates, which could ultimately translate into higher enrollments. Currently, the following courses are offered through the CIM program:

CORE COURSES:

- * CIM 110 Introduction to Computer Integrated Manufacturing
- CIM 210 Plant Networking and Computer Systems Applications
- CIM 220 Machine Tool Communications
- * CIM 230 Introduction to Computer Aided Manufacturing
- * CIM 240 Flexible Manufacturing System Applications

(*Currently being offered)

REQUIRED SUPPORTIVE COURSES:

- ATM 210 Basic Numerical Control Programming
- ATM 220 Numerical Control Machining
- CAD 110 Introduction to Computer Aided Design and Drafting
- CAD 120 Product Detailing
- ECT 208 Introduction to Microprocessors
- ENG 135 Business Communications
- EEC 102 DC Fundamentals
- EEC 104 AC Fundamentals
- MAT 115 Intermediate Algebra
- MEC 101 Introduction to Manufacturing Processes
- ROB 150 Introduction to Robotics
- ROB 204 Electrical Automation Circuits and Logic Fundamentals

METHODOLOGY

In September 1994, 69 employers in Southeast Michigan were contacted to answer questions regarding employment opportunities and skill requirements. Respondents were asked to comment on the content of OCC's CIM program in light of their own employment needs. A similar survey designed to gauge student opinion of the CIM program was also carried out in September 1994. Twenty-three students who had taken a CIM course between fall 1993 and summer 1994 were contacted. Survey instruments appear in Appendices A and B.

Frequency distributions and correlations were used in the quantitative analysis of the survey data. Narrative responses from both students and employers were analyzed and appear verbatim in Appendices C and D.

ANALYSIS

Occupational Outlook

Employees trained to work with CIM systems can be found in a wide variety of positions. Machinists, numerical control operators, tool and die makers, and tool programmers may all be involved in the CIM process in today's workplace. Given the differences in job descriptions and duties, the occupational outlook depends on the specific industry.

Numerical control (NC) operators are increasingly required to work with computer numerically controlled (CNC) machines. According to the U.S. Department of Labor's publication The Occupational Outlook Handbook, position openings which require CNC training are expected to increase nationally through 2005. Manual machinist position openings are expected to decrease. While NC operator duties will vary from position to position, most employers expect skills in the following areas: program loading, workpiece positioning, tool attachment, and routine maintenance systems checks. Increasingly, NC operators are involved in program adjustment and debugging. Nationally, manufacturers employed 73,000 CNC operators from a total of 1,378,000 machine operators in 1992.

Machinists are trained in a variety of shop skills including filing, handtapping, and dowel fitting. Machine tool operation is also required, as is knowledge of mathematics, physics, blueprint reading, and mechanical drawing. Formal apprenticeship programs with an employer are common in this field. While traditional machinists are not typically involved in computer operations, basic computer knowledge is of growing importance. In 1992, 359,000 machinists were employed nationally. These figures are expected to decline slightly through 2005, as computer technology reduces the number of workers required for efficient operation.

Traditionally, tool and die makers have been highly skilled workers responsible for creating the tools used in the manufacturing process. Through lengthy apprenticeship programs, tool and die makers receive extensive training in mathematics, machining, blueprint reading, and tool assembly. Increasingly, computer aided design (CAD) systems are utilized in product development. In 1992, 138,000 tool and die makers were employed nationally; these figures are expected to decline slightly through 2005.

Tool programmers are required to have advanced machining skills as well as detailed knowledge of computer operation and electronics. While not an industry requirement, some employers prefer to hire applicants with degree-level training in engineering. Tool programmers are typically trained in numerical control and computer aided design, and are proficient in various

employers prefer to hire applicants with degree-level training in engineering. Tool programmers are typically trained in numerical control and computer aided design, and are proficient in various programming languages. Like machinists, many tool programmers receive much of their training through on-site apprenticeship programs.

Salary and Employee Benefits

Nationally, machinists and tool programmers earned an average of \$450-500 per week in 1992, as did NC operators. Tool and die makers averaged slightly higher salaries at \$642 per week. Most employers offer health insurance, pension plan, and paid vacation and sick leave, although specifics vary from employer to employer. Employees with formal CIM training tend to earn more than those without, although generalization is difficult given the wide variety of positions which may involve some aspect of CIM.

Opportunities for Women and Minorities in CIM

Of the 23 students respondents in the CIM student survey, 20 (87%) are male, and 21 (91%) are white. These figures are consistent with CIM enrollments for the past year. Between fall 1993 and summer 1994, just 8 women enrolled in a CIM course. Eighty-seven percent of CIM students have been white, a figure which matches college-wide ethnic enrollment.

Currently Available Training

While several southeastern Michigan institutions offer courses or programs which overlap with OCC's CIM program, no other associate degree program exists in the area. Henry Ford Community College in Dearborn offers several similar programs, and Lawrence Technological University in Southfield offers a master's degree emphasizing CIM concepts. OCC's Business & Professional Institute offers selected CIM courses to local industries by individual arrangement.

Henry Ford Community College

Henry Ford Community College offers an associate program in Manufacturing Engineering Technology. Students have the option of concentrating their coursework in computerized numerical control concepts. The 37-hour core curriculum for the program is as follows:

MET 100	Manufacturing Processes
MET 110	Manufacturing Processes II
MET 130	Quality Control Gaging and Inspection
MET 140	Numerical Control Concepts
MET 150	SPC (Speech Communication) in Manufacturing
MET 145	CNC Operations
MET 160	Computer Assisted NC Programming
MET 170	Advanced Computer Assisted NC Programming
MET 210	Non-traditional Manufacturing Processes
MET 275	Advanced CNC Operations
DRAF 110	Introduction to Industrial Drafting
DRAF 130	Technical Descriptive Geometry

In addition to the associate program in Manufacturing Engineering Technology, Henry Ford offers a certificate program in Computer Numerical Control. This program is designed to prepare students for entry-level employment in CNC programming and equipment operating.

Henry Ford Community College has also developed numerous programs through their Trade and Apprentice Education Division. According to the course catalog, "the programs, established in cooperation with industry, provide the theoretical and practical knowledge required to supplement on the job experience." While no CIM program is offered, many of the curricula are designed to provide training for careers which may ultimately involve aspects of CIM. Students opt to focus on one of a variety of skilled industrial occupations, including tool and die maker, machinist, and plant operator.

Milford Fabricating, a Detroit-based prototype company with a lengthy history of apprentice training, requires new trainees to complete an apprenticeship program at Henry Ford. Through a 24-course, 4-year program, students receive experience in mathematics, drafting, and programming. Courses of study vary depending on the employee's responsibilities at the company. Milford has offered extensive apprenticeship training programs to its employees since the 1950's and has been sending employees to HFCC for training since 1989. An additional fifth year of training is also available to employees with extensive involvement in computer-integrated manufacturing. These courses are offered through OCC's CIM program.

OCC Business & Professional Institute

In July 1994, OCC's Business & Professional Institute was granted funding through the Governor's Workforce Commission for the purpose of "upgrading the existing workforce and training new employees" of several local industries. Resources will be used to provide training through OCC's CIM program as well as Henry Ford Community College's apprenticeship program.

The largest portion of the state grant was awarded to Milford Fabricating. The grant awarded through BPI provides for 91 credit hours of training at OCC and 486 at Henry Ford. A total of 108 Milford employees will participate in grant-funded training. Currently, 8 are enrolled in OCC's CIM program.

Two other companies were also awarded funding. Deco Grand will send 242 employees to OCC for training in a variety of skill areas. However, none of the scheduled courses are offered through the CIM program. Foamade Industries will send 80 employees to OCC for a 40-hour training program in Manufacturing Resource Planning.

Lawrence Technological University

Lawrence Tech offers an associate degree in engineering technology, as well as several bachelor's degree programs and a master's program in manufacturing systems. At the associate level, students choose one of four concentrations: construction, mechanical, electrical, or industrial engineering technology. Coursework involving CIM concepts is concentrated in the MEMS (Master of Engineering in Manufacturing Systems) program. Working professionals with undergraduate engineering degrees and experience in the field are taught to recognize the "vital relationships and interplay between manufacturing, engineering, research, suppliers, marketing, sales, and management."

Several other institutions in the region offer courses addressing the concepts of CIM through CAD/CAM programs. Jackson, Macomb, Schoolcraft, and Washtenaw Community Colleges fall into this category. However, formal programs in CIM are not in place.

Employment Opportunities

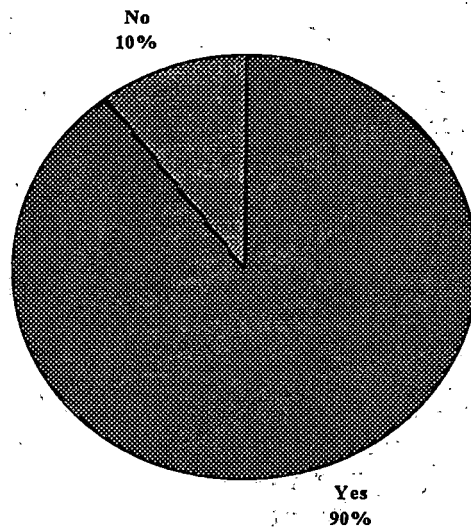
The 69 employers surveyed as part of this study represent a wide variety of manufacturing types. Employers indicated the type of manufacturing done by their company; a complete list of these responses appears in Appendix C.

Over two-thirds (68%) of those responding employ less than 150 people. Seventy percent stated that less than one-third of their employees have CIM training. Employers were then asked to estimate the percentage of employees receiving training through on-the-job experience, apprenticeships, associate degree programs, and four-year programs. According to employers, most training is received on the job. Over one-quarter (28%) of employers stated that 100% of their employees have received their CIM training in this way. When questioned about formal apprenticeship programs, 72% stated that none of their employees have received training in this way. Nearly half (49%) said that none of their employees have associate degree training in CIM, while 51% indicated that no employees have a four-year or advanced degree in CIM.

Of those surveyed, just over half feel that most new hires have adequate training in CIM. However, 49% disagree, stating that most new employees are hired without adequate training in CIM. Employers were next asked whether they provided employees with CIM training. The majority (88%) of employers do provide training when deemed necessary.

Table 2
Does Company Provide CIM Training?

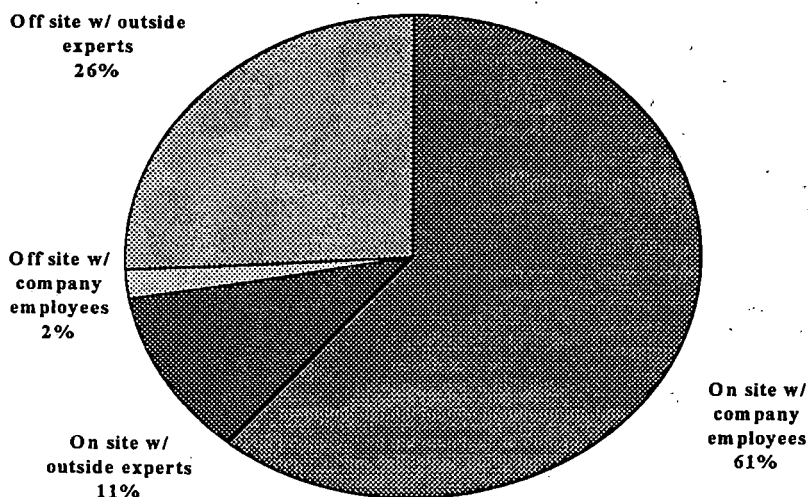
Response	Number Responding	Percent of Total
Yes	61	89.7
No	7	10.3
Total	68	100.0



Types of training provided vary by location (on or off-site) as well as by provider (company employees or outside experts.) Respondents were asked to identify the type of training which best matched the training programs at their companies. Survey responses reveal that employers favor on-site training, often utilizing the skills and expertise of other employees to train those with less experience. Responses to this question are presented in the following graph.

Table 3
Type of Training Provided

Type	Number Responding	Percent of Total
On site, with company employees	33	61.1
On site, with outside experts	6	11.2
Off site, with company employees	1	1.8
Off site, with outside experts	14	25.9
Total	54	100.0



When asked about current programs, 47% of employers stated that their employees are involved in CIM training. The most commonly mentioned reason for current training (42%) is the lack of skills to operate constantly changing hardware and software. Employers spoke of the importance of keeping up with the industry. One employer responded, "We can't find people with the proper training...I, like many other employers, have developed my own training system." There is a sense among employers that training needs are best met from within the business. Either by using experienced employees to assist in on-the-job training or by bringing in industry experts from the outside to run training programs, employers are able to target the specific skills they want their employees to gain. Employers stress the ongoing nature of the CIM training process in remaining competitive in the market, and many feel that in-house training is the best way to accomplish this. Employers like Milford Fabricating, who have opted to train employees through

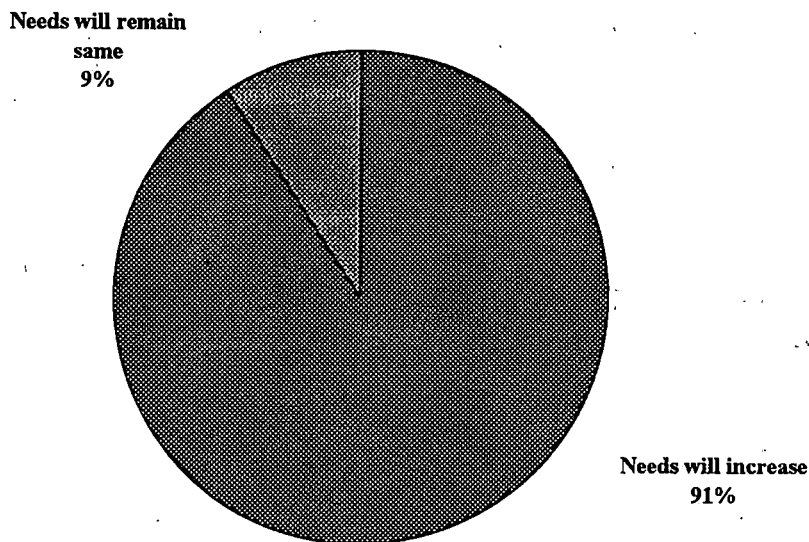
local community colleges or vo-tech programs, point to the flexibility of these educational institutions as a primary reason for the success of the relationship.

Employers' responses to the question of whether they are currently hiring CIM employees were almost evenly split. Fifty-two percent stated that they are not currently hiring while 48% responded that they are. The most commonly cited reason for hiring was company expansion. While some stated that they are currently hiring for specific positions which cannot be filled internally, no employers mentioned a lack of skill among current employees as a reason for hiring from outside the company. When current employees do in fact lack specific job skills, many employers prefer to provide them with on-the-job training. Employers commented on the difficulty of finding potential employees who have all necessary skills. This makes training programs--whether on-site using other employees or with the help of an outside expert--a necessity for many businesses.

Of those surveyed, the vast majority (91%) anticipate that their company's need for employees with training in CIM will increase over the course of the next five years. Nine percent feel that CIM needs will remain stable during this time period. None of the employers responding to the survey anticipated a decline in CIM needs in the near future.

Table 4
Anticipation of Future CIM Needs

Response	Number Responding	Percent of Total
Needs will increase	60	91.0
Needs will remain same	6	9.0
Total	66	100.0

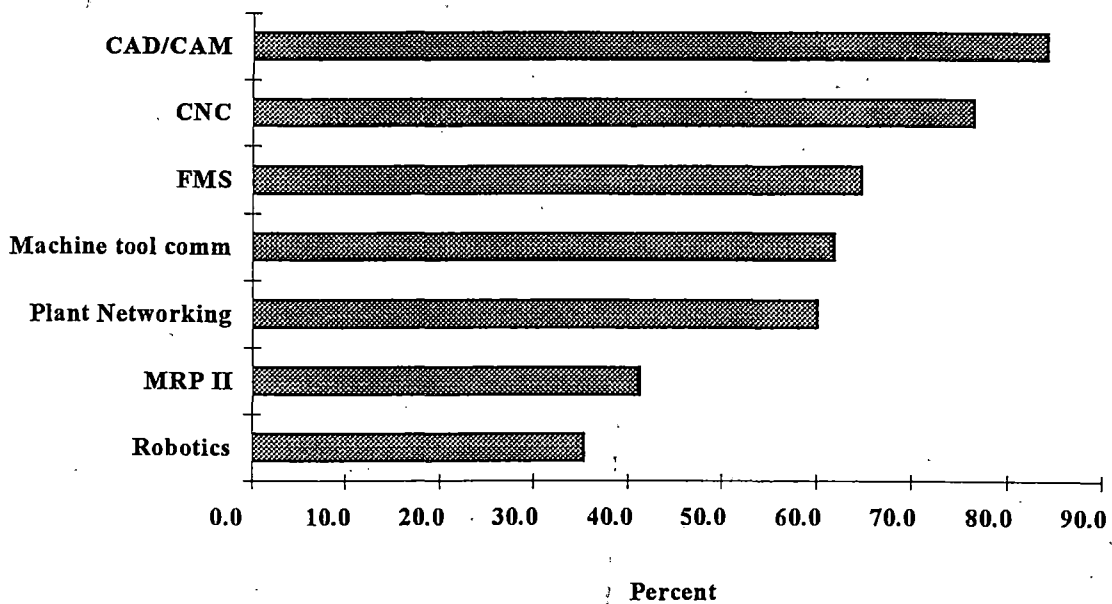


Finally, employers were asked to identify specific skill and knowledge areas which are important to them when hiring new CIM employees. Of the seven skills illustrated below, the most important to employers is knowledge of CAD/CAM systems (84%). The only skill area identified as "not important" to the majority of employers is robotics (65%). These findings support faculty assertions that employers are increasingly looking for employees with CAD/CAM experience.

Table 5

Skills Rated Important by Employers

	Important	Not Important
Robotics	35.3	63.8
MRP II	41.2	58.8
Plant Networking	60.0	40.0
Machine tool comm	61.8	38.2
FMS	64.7	35.3
CNC	76.5	23.5
CAD/CAM	84.1	15.9



Upon completion of the survey, employers were asked whether they would be willing to assist OCC in making changes to the current CIM program. Thirty-two percent (22) expressed an interest in doing so. A complete list of all employers surveyed appears in Appendix ; the names and addresses of those willing to assist OCC in developing the CIM program are identified by bold type.

Profile of OCC Computer Integrated Manufacturing Students

Of the 72 OCC students who enrolled in a CIM course between fall 1993 and summer 1994, 23 were surveyed to determine reasons for enrollment in the program as well as current employment information. Of those surveyed, 69% cited preparation for a new career involving CIM as the major reason for enrollment in a course. Nearly four-fifths (78%) of respondents stated an intention to improve knowledge or skill for a current job as a major reason for enrolling in a CIM course.

When asked about their current employment status, 87% of respondents reported working full-time. When asked to estimate the degree of relatedness between their current job and their CIM coursework, 75% reported a score of 7 or above on a 10 point scale with 10=highly related.

The issue of incorporating additional CAD/CAM courses into the CIM program has been introduced by the faculty. When asked to comment on this possibility, 60% of students responded that more CAD/CAM courses would have been of use to them. Those in favor of adding more CAD/CAM courses generally feel that the extra experience will prove beneficial when entering the job market. Those opposed tended to feel that additional courses would make the program too broad. When asked to rate the program for course content, relevance, and quality, over 70% reported satisfaction. Satisfaction rates for equipment and course variety were above 60%. Lower levels of satisfaction applied to course frequency, with 52% of respondents indicating dissatisfaction.

Upon completion of the survey, respondents were given the opportunity to make other comment about their experience in the program. Generally, students were pleased with the program. The most common suggestion was the incorporation of more "hands-on" experience into the program. Students praised the equipment, but some felt it could be utilized to a greater degree. Finally, several students commented that the program could benefit from increased marketing efforts in business and industry.

CONCLUSION

Summary

Although the majority of employers anticipate that their need for CIM trained employees will grow over the next five years, findings reveal that most current training (61%) is done on site using the knowledge and expertise of other company employees to train those with less experience.

Among the businesses contacted, the majority of employees received their CIM training while on the job. This form of training outnumbers the formal apprenticeship as well as the associate degree or bachelor's degree.

Those employers who do opt to send employees to local community colleges or training centers often want their employees to gain specific skills rather than an overview of CIM. CAD/CAM skills in particular are important to employees, as are skills in CNC and knowledge of Flexible Manufacturing Systems. However, many employers feel that company needs are best understood by those within and have therefore developed individualized training programs. Whether these programs are implemented by company employees, by outside experts, or with the assistance of a local community college or training centers, employers stress the importance of keeping pace with technology as well as remaining aware of and responsive to industry needs.

Issues

When considering the future of the CIM program at OCC, it should be noted that a need does in fact exist for CIM-trained employees. Because the program is conceptual in nature and does not train for a specific occupation, further exploration into the needs of a variety of employer types is appropriate. Employers who participated in the survey and indicated a willingness to help OCC in developing its CIM program should be considered a valuable source. In-depth interviews or focus groups including these employers could assist OCC in identifying an appropriate niche in the CIM market.

Finally, the possibility of restructuring the CIM program to incorporate courses from other OCC programs should not be discounted. Employers indicated a high level of need for employees with CAD/CAM training; adding more of these courses to the existent CIM program would begin to address this need.

*Oakland Community College
CIM Needs Assessment
October 1994*

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APPENDIX A
COMPUTER INTEGRATED MANUFACTURING
STUDENT SURVEY

COMPUTER INTEGRATED MANUFACTURING STUDENT SURVEY

Student's Name: _____

Student's Social Security Number: _____

1. I am going to read you a list of common reasons why students enroll in CIM courses. Please tell me if the following statements were a major reason, minor reason, or not at all a reason for your enrollment in a CIM course at OCC:

	<i>Major Reason</i>	<i>Minor Reason</i>	<i>Not At All a Reason</i>	
a. To obtain a certificate in CIM.....	3	2	1	9
b. To obtain an associate degree in CIM.....	3	2	1	9
c. To complete courses necessary for transfer.....	3	2	1	9
d. To prepare for a new career in CIM.....	3	2	1	9
e. To improve knowledge and skill for your job.....	3	2	1	9
f. To comply with employer's requirements.....	3	2	1	9
g. Other (<i>describe</i>) _____				

2. What is/was your major field of study at OCC?

CIM _____ Computer Integrated Manufacturing
 CAD _____ Computer Aided Design
 ROB _____ Robotics/Automated Systems Technology
 MAC _____ Machine Tool Technology
 ELE _____ Electrical/Electronics Technology
 GEN _____ General Studies
 Other _____ (*please specify*)

3. Are you currently employed, or are you not currently in the workforce?
If employed ask -> Is your employment full-time or part-time work?
If unemployed ask -> Are you currently seeking employment?

1 _____ Full-Time
 2 _____ Part-Time
 3 _____ Unemployed and seeking work (*skip to question 7*)
 4 _____ Unemployed and not seeking work (*skip to question 7*)
 9 _____ No response

4. What is your current job title?

(Be specific) _____

5. On a scale from one to ten, with ten being "highly related" and one being "not at all related", to what extent is your current employment related to your CIM coursework? (If they choose 1,2,3 or 4, skip to question 8)

Not at all related 1 2 3 4 5 6 7 8 9 10 Highly related

6. Have you found that your current job has required specific knowledge and skills which you did not receive as part of your OCC CIM training?

1 _____ Yes

0 _____ No

9 _____ No response

If so, please provide specific examples:

7. Do you feel that OCC's CIM program would be/would have been more useful to you if it had incorporated more CAD/CAM courses? Why or why not?

8. Please rate your level of satisfaction with the following aspects of the CIM program using the scale Very Satisfied, Satisfied, Neutral, Dissatisfied, Very Dissatisfied.

	<i>Very Satisfied</i>	<i>Satisfied</i>	<i>Neutral</i>	<i>Dissatisfied</i>	<i>Very Dissatisfied</i>	<i>No Response</i>
a) The variety of CIM courses offered	5	4	3	2	1	9
b) The relevance of CIM courses to your career path	5	4	3	2	1	9
c) The content of CIM courses	5	4	3	2	1	9
d) The frequency with which specific CIM courses are offered	5	4	3	2	1	9
e) The quality of faculty/instruction in CIM	5	4	3	2	1	9
f) The quality of CIM equipment available at OCC for student use.....	5	4	3	2	1	9

9. Is there any other comment you would like to make about the CIM program at OCC?

(Continue on back if neces

"Thank you very much for your time and assistance. We sincerely appreciate your help."

Interviewer Signature: _____ Date: _____

APPENDIX B
COMPUTER INTEGRATED MANUFACTURING
EMPLOYER SURVEY

COMPUTER INTEGRATED MANUFACTURING

Employer Survey

We at OCC are currently considering making changes to our Computer Integrated Manufacturing program. Included in the current program is training in computer aided design (CAD), computer aided manufacturing (CAM), computer numerical control (CNC) and robotics.

1. Does your company utilize Computer Integrated Manufacturing or any of the related technologies just mentioned?

Yes
 No (*Thank them for their time and discontinue survey*)

2. Please describe the type of manufacturing your company does:

3. In total, how many people are currently employed by your company?

1 less than 50
2 less than 150
3 less than 500
4 over 500
7 Don't know
9 No response

4. Roughly what percentage of these employees are trained in computer integrated manufacturing? (*if they do not know the approximate percentage or if they do not have any CIM-trained employees, discontinue survey.*)

5. Of those employees with CIM training, what percentage received their training in:

1 On-the-job training (informal)
2 Apprenticeship program
3 Associate degree program
4 Four-year degree program

6. Does your company provide training for employees with inadequate experience with CIM?

1 Yes
0 No (*Skip to 9*)

9 ___ No response

7. Are any of your employees currently involved in training?

1 ___ Yes

0 ___ No

9 ___ No response

If yes, please specify reasons: _____

8. Which of the following best describes the training you provide?

1 ___ On-site, conducted by company employees

2 ___ On-site, conducted by outside experts in the field

3 ___ Off-site, conducted by company employees

4 ___ Off-site, conducted by outside experts in the field

5 ___ Other (please specify) _____

9. Are you currently hiring new employees with CIM training?

1 ___ Yes

0 ___ No

9 ___ No response

If yes, please specify reasons: _____

10. Do you anticipate that your need for employees with training in computer integrated manufacturing will increase, decrease, or remain about the same in the next five years?

3 ___ Increase

1 ___ Decrease

2 ___ Remain about the same

7 ___ Don't know/cannot anticipate

11. When hiring new employees with CIM training, do you find that most have adequate training, or are most inadequately prepared for the requirements of the position?

1 ___ Adequately trained

0 ___ Not adequately trained

9 ___ No response

12. Given your company's needs, which of the following skill and knowledge areas are important when hiring CIM employees?

	Yes	No
1 ___ Understanding of flexible manufacturing systems.....	1	0
2 ___ Numerical control programming (CNC).....	1	0
3 ___ CAD/CAM systems.....	1	0
4 ___ Robotics.....	1	0
5 ___ Plant networking/computer systems.....	1	0
6 ___ Machine tool communications.....	1	0
7 ___ MRP II (Manufacturing Resource Planning).....	1	0
8 ___ Other (please specify):		

13. Would you be willing to assist Oakland Community College in developing the CIM program?

- 1 ___ Yes
- 0 ___ No
- 9 ___ No response

Thank you for your time and assistance. We appreciate your help and believe that your responses will help to influence what happens at OCC in the future. If you have any further questions please contact the Office of Planning and Analysis at (313) 471-7746.

Interviewer Signature: _____

Date: _____

APPENDIX C
COMPUTER INTEGRATED MANUFACTURING
EMPLOYER TYPES

1. Design and Engineering
2. Investment castings
3. Auto conveyer systems
4. Automotive tooling
5. Tool and die/stampings
6. Machine shop turning/drilling
7. Robotics
8. Air craft parts
9. Turning/milling
10. Chemical and oil pumps
11. Dash insulators for autos
12. Home cleaning devices
13. High speed transfer equipment
14. CNC turning center/injection molding
15. Electrical devices/surface mountings
16. Audio-video for auto shows
17. Plastic injections moldings
18. Lint rollers and brushes
19. Chemicals
20. Automations
21. Automations
22. Tools and robotic parts
23. Cabinet fixtures
24. Metal stamping
25. Hole cutting tools for automotive/rail
26. Anti-corrosion coatings for automotive
27. Circuit boards
28. Sugar processing
29. Automotive compression springs
30. Automotive and aeronautics tools, fixtures, and gauges
31. Tool design
32. Machine tool
33. Aircraft parts
34. Automotive interiors
35. Assembly conveyers
36. Automotive and aeronautics fixtures
37. Metal and plastic prototyping
38. Automotive stamping and assembly
39. Optical devices for use in laser defraction
40. Lint rollers and brushes
19. Chemicals
20. Automations
21. Automations
22. Tools and robotic parts
23. Cabinet fixtures
24. Metal stamping
25. Hole cutting tools for automotive/rail
26. Anti-corrosion coatings for automotive
27. Circuit boards
28. Sugar processing
29. Automotive compression springs
30. Automotive and aeronautics tools, fixtures, and gauges

31. Tool design
32. Machine tool
33. Aircraft parts
34. Automotive interiors
35. Assembly conveyers
36. Automotive and aeronautics fixtures
37. Metal and plastic prototyping
38. Automotive stamping and assembly
39. Optical devices for use in laser defraction
40. CNC machining
41. CNC machining
42. Engineering and design of automated vehicles
43. Plastic injection molding
44. Roof and floor trusses
45. Plastics, automotive
46. Machine tool systems
47. Automotive forging
48. Automated foundry equipment
49. Sheet metal stamping and assembly
50. Toggle clamp manufacturing
51. Structural steel supplier to power/utility industry
52. CAD system assembly facility
53. Design and machining for fastener systems
54. Stamping--electrical connectors and injection molding
55. Tool and die work for packaging
56. Design and build automated finishing systems
57. Manual transmissions
58. Welding fixtures
59. Seat belts and air bags
60. Parts and tools for auto industry
61. Design machines to build plastic parts
62. Automotive forging
63. Plastic injection molds
64. Plastic parts for auto interiors
65. Stamping and welding
66. Auto stamping
67. Machining
68. Molds for plastic injection parts
69. Building automotive tools
70. Cold -headed products

APPENDIX D
COMPUTER INTEGRATED MANUFACTURING
EMPLOYER NARRATIVE RESPONSES

Appendix D Employer Narrative Responses

Other skills considered important when hiring CIM employees:

1. Maching ability
2. Being able to train others
3. Plastics experience
4. Experience in testing and designing equipment; quality control; certification
5. People/communication skills
6. Business programming applications
7. Students should be trained to envision the final product of what they're doing.
8. More computer languages
9. Ability to read basic checking and measuring instruments; basic math; GD &T.
10. Rudimentary knowledge of JIT (Just in Time Planning)
11. Good math skills
12. Machine set-up
13. Background in manual board experience
14. CRP--Capacity Requirements Planning--goes hand in hand with MRP II
15. Applied technical background in machine tool trades
16. Common sense skills; writing ability; technical writing skills
17. CGS; CATIA; AUTOCAD; AUTOTROLL; PDGS; general PC experience

Reasons why employees are currently involved in training:

1. New CNC equipment
2. To learn new state of the art software
3. To get to know the product better
4. To better understand the job
5. Four new hires
6. New CAD system involving new hardware and software
7. An ongoing process--each project requires new knowledge
8. New equipment
9. To train hires for new job
10. New responsibilities due to transfer from another department
11. Company expansion
12. We can't find people with the proper training. (If we were in Germany, this wouldn't be a problem. I., like other employees, have developed my own training system.
13. We hire inexperienced people at low wages and let them progress at their own pace.
14. To keep current with technology
15. Training is on-going
16. So they can do their jobs
17. A designer quit--replacement is being trained
18. New software
19. Changing system/software. Going from Computer Vision to ProEngineering
20. Need more people trained in CAM
21. Most employees come from shop into engineering department--need additional skills for job upgrade
22. Can't find people trained in the area of plastic injection molds
23. We have constant, on-going training to keep employees current
24. We promote from within and are constantly training
25. Each of our customers has different software we have to learn
26. We have on-going training to keep current

Other type of training provided

1. Company offers 1500.00 per year tuition reimbursement
2. Employees take classes at local colleges
3. CATIA classes at local colleges or special schools
4. College of choice paid for by company

Reasons for current hiring:

1. CNC operator position open
2. CAM position open
3. CNC operator position open

****All others who are currently hiring are doing so in response to company expansion.**

APPENDIX E
COMPUTER INTEGRATED MANUFACTURING
EMPLOYER LIST

**Appendix E
Employer List**

Bold=Willing to help OCC develop program

Karen Kelly, Recruiter
Time Manufacturing Systems
Troy, MI
810 362-6500

Dave Hall, Data Coordinator
Blanchford, Inc
Troy, MI
810 689-7800

Dale Susan, Process Engineer
Barroncraft
Oxford, MI
810 628-9596

**Mike Giuffre, Director of Info Services
Rexair, Inc
Troy, MI
810 643-7222**

**Larry Beardslee, Controller
Fabricating Engineers, Inc
Flint, MI
810 257-2270**

**Mike Zimmerman, Assistant Manager
Hadron, Inc
Warren, MI
810 497-6007**

Ellie Smith, Office Manager
National Pattern, Inc
Saginaw, MI
517 755-6274

**Duane Chalker, Manufacturing Engineer
Dynamic Seals, Inc
Troy, MI
810 362-0170**

Dennis Prentis, Controller
Koppy Corporation
Lake Orion, MI
810 373-5200

Bruce Shaw, Chief Engineer
Compunetics, Ince
Troy, MI
810 588-7373

Personnel
Rochester Manufacturing Co
Rochester, MI
810 652-2600

Kent Culp, Technical Services Manager
City Animation Co
Troy, MI
810 589-0600

Personnel Manager
VSI Automation Assembly Inc
Auburn Hills, MI
810 853-0555

Tom Leonard, Project Coordinator
Cavity Craft, Inc
Troy, MI
810 689-1124

Personnel Manager
Ventura Industries
Plymouth, MI 313 459-3900

Laurie Valasek, Accounting Manager
Helmec Products
Flint, MI
810 239-7677

Office Manager
Numerical Machining Co, Inc
Auburn Hills, MI
810 335-8400

Joanne Wozniak, Human Resources
Foamseal Inc
Oxford, MI
810 628-2587

**Kim Actis, Office Manager
Johnstone Pump Co, Inc
Troy, MI
810 362-1400**

Personnel Manager
Automation & Modular Components Inc
Auburn Hills, MI
810 373-3900

Personnel Manager
Automated Systems, Inc
Auburn Hills, MI
810 373-5600

Todd Horner, Supervisor
Longhorn Tool Co
Auburn Hills, MI
810 373-3010

Personnel Manager
Multi Precision Detail Inc
Auburn Hills, MI
810 3730-3330

Marie Ventimiglia, Personnel Manager
Hawthorne Metal Products Co
Royal Oak, MI
810 549-3800

Donald Walter, Personnel Administrator
Hougen Manufacturing Inc
Flint, MI
810 732-5840

Q.V. Pittman, Plant Controller
Wesley Industries Ince
Flint, MI
810 787-3077

Mark Di Falco, President
Excel Circuit Co
Orion, MI
810 373-0700

Larry Yock, Instrumentation Supervisor
Michigan Sugar Co
Saginaw, MI
517 799-7300

John Bekler, Operations Manager
American MSC Inc
Troy, MI
810 589-7770

Debra Thomas, Assistant Controller
McKenna Group
Troy, MI
810 689-4800

Matt Karr, Chief Engineer
M & T Design
Madison Heights, MI
585-4162

Gary Kelley, Senior Contract Engineer
Advanced Technologies
Troy, MI
583-7249

Ernie Stabenow, Plant Manager
Triple Industries
Troy, MI
583-1911

Dean Herr, Data Administrator
Findlay Industries
Troy, MI

Bob Rachel, Applications Engineer
Automation and Modular Components
Auburn Hills, MI
373-3900

Debbie Deakin, Personnel Manager
Models & Tools, Inc
Troy, MI
810 585-4540

Bob Miller, Systems Engineer/Manager
Quasar Industries
Rochester Hills, MI
810 852-0300

Tom Trombley, Manufacturing Engineer
Comcorp Technologies
Warren, MI
810 755-4488

Steve Hodits, VP of Finance and Administration
Speedring Systems, Inc
Rochester Hills, MI 810 853-2540

Mike Fitzpatrick, CEO
Fitzpatrick Manufacturing
Troy, MI
810 588-0066

Dennis Brophy, Quality Control Manager
Accurate Gauge Manufacturing
Rochester, MI
810 852-7367

Sharon Moore, Human Resources
S.L. Handling Systems
Rochester Hills, MI
810 299-4400

Marge Rainer, Layout Technician
Becker Manufacturing
Auburn Hills, MI
810 377-1110

Janet Clayton, Controller
Delta Truss, Inc
Saginaw, MI
517 752-7141

Beverly Williams, Human Resources
Mantex Corporation
Oxford, MI
810 628-8200

Eric Fredland, Manager
Thyssen Productions
Troy, MI
810 589-3000

Ron Kramer, Training Facilitator
MSP
Oxford, MI
810 628-8200

Dave Marthaler, Plant Supervisor
Seaton-SSK Engineering Inc
Au Gres, MI
517 876-7161

Eric Reno, Systems Administrator
Ralco Industries
Auburn Hills, MI
810 853-3200

George Yantz, Data Base Manager
De-Sta-Co
Troy, MI
810 589-2008

Kathy Larson, Accounting Manager
Energy Steel and Supply Co
Auburn Hills, MI
810 377-4990

Michael Saunders, CAD Center Manager
Unisys Corporation
Plymouth, MI
313 451-4000

Rick Howard, Plant Superintendent
Teledyne Howell Penncraft
Plymouth, MI

313 453-8800

Kurt Steen, Manager, Info Systems Department
Cardell Corporation
Rochester Hills, MI
810 853-3360

Frank Stuben, Engineering Supervisor
Bernal Division
Rochester Hills, MI
810 299-3600

Christopher Piper, Mechanical Designer
Jessup Engineering Inc
Rochester Hills, MI
810 853-5600

Charlotte Chase, Personnel Manager
New Venture Gear Corporation
Troy, MI
810 680-4900

Personnel
Carftmation, Inc
Troy, MI
810 689-8340

Jan Smith, Personnel Manager
Irvin Industries
Auburn Hills, MI
810 377-1500

Terry Podoska, Human Resources
Handy & Harman Automotive Group
Auburn Hills, MI
810 377-0700

Personnel
T.A. System, Inc
Rochester, MI
810 656-5150

Wayne McCain, Human Resources
Masco Tech
Royal Oak, MI
810 549-2700

Mike Suits, CAD/CAM Manager
Hi Tech Mold & Engineering
Rochester Hills, MI
810 852-6600

Roger Magerman, Engineering Manager
T.D. Shea Manufacturing
Troy, MI
810 585-9440

Julie Peters, Human Resources
Lapeer Metal Products
Lapeer, MI
810 664-8588

Raju Alluru, Tooling Engineer
Yarema Die & Engineering
Troy, MI
810 585-2830

Stan Morley, Director of Quality
Sherwood Metal Products
Waterford, MI
810 673-2303

Mike Fleming, Quality Assurance Mgr.
Dynasty Mold
Rochester Hills, MI
810 656-2626

Lori Garga, Office Manager
Dimensional Mold & Engineering
Rochester, MI

Rick Johnson, Info. Systems Coordinator
G.B. DuPont
Troy, MI
810 879-0200