



CAD/CAM

NEWSLETTER



September 1986

Information Compiled by the Canadian CAD/CAM Council

for the Advancement of Computer Integrated Manufacturing *

Summary of this Issue

- 1 - CAD/CAM Council Issues 1986 Report
- 2 - Coordination Meeting Held for CAD/CAM Centres
- 3 - International Comparisons
- 4 - Workshop on Integrated Circuit Design
- 5 - Book Reviews
- 6 - CAD/CAM Publications Available
- 7 - CAD/CAM Quotes
- 8 - Abstracts Section Attached for a World View of CAD/CAM

1. CAD/CAM Council Issues 1986 Report

Enclosed with this newsletter issue readers will find an order form or a copy of the CAD/CAM Council's 1986 report "Management in Crisis: Implementing Computer Integrated Manufacturing in Canada" as provided by the secretariat for newsletter distribution.

Readers will recall that the council has issued two major reports in previous years, namely "Strategy for Survival" in 1980 and "Closing the Gap" in 1983. Both of these reports, addressed to Canadian industry, educational institutions and government, dealt with technology and policy issues on a broad basis.

In order to continue dealing effectively with issues raised by the introduction of computer integrated manufacturing in Canadian industry, the council has elected in this and future reports to identify key issues for focussed attention in a timely manner. The 1986 report does this, focussing on the need for strategic planning on computer integrated manufacturing by senior executives in industrial companies. The Council, in producing this 1986 report, was assisted by the School of Business Administration at the University of Western Ontario and the Saskatchewan Research Council.

The content and message of the report is contained in the following quotes from its executive overview. Some additional quotes are given in section 7 of this newsletter.

"Factory automation is known today as computer integrated manufacturing, or CIM. There is widespread consensus, supported by mounting evidence, that CIM represents a major change in the traditional methods and management approaches to manufacturing.

CIM is not a single technology. It is a philosophy and a direction for industrial enterprises, affecting the whole company. It is achieved only in a series of stages as an evolution. The important thing is to get started, at the right time, and before it is too late. ----

Strategic planning for CIM must be corporate wide, led by the Chief Executive Officer, the Board, and all top management. Manufacturing as a strategic tool has for too long been overlooked as an area for competitive advantage."

We urge you to a full reading of the report and to distribute one or more copies for discussion within your company or organization. Additional copies of the report may be obtained in English or French from the secretariat of the CAD/CAM Council as follows:

Contact: Secretariat
Canadian CAD/CAM Council
Office of Industrial Innovation, 5th Floor Centre
Department of Regional Industrial Expansion
235 Queen Street
OTTAWA, Ontario
K1A 0H5

2. Coordination Meeting Held for CAD/CAM Centres

On October 15-16 an information and coordination meeting was held in Montreal for representatives from CAD/CAM centres across Canada. The October 1986 meeting was the fifth such opportunity, previous coordination meetings having been held approximately annually since 1982. For the 1986 meeting representatives from university and technical college based centres were each invited to send a representative, with the result that fifty to sixty persons attended, in addition to centres for whom industry is the main clientele.

There was a free and useful exchange of information, including a review by E. Cinitis, Chairman of the Canadian CAD/CAM Council, of the mission statement of the council as given in the June CAD/CAM Newsletter.

Like Shakespeare's seven stages of life, a representative from the Ontario Centre for Advanced Manufacturing (OCAM), described the following seven steps in the CIM decision process by which it is possible to identify the status and progress of individual companies.

- 1 - Ignorance or innocence - A zero level of awareness
- 2 - Awareness - General Knowledge, attendance at trade shows etc.
- 3 - Understanding - Reasonably comprehensive knowledge of costs/benefits, etc.
- 4 - Conviction - By management - feasibility studies initiated etc.
- 5 - Commitment - Equipment orders and contracts placed etc.
- 6 - Implementation - Installation, start up and staff training
- 7 - Exploitation/optimization - Reaping of both the tangible and intangible benefits

These and other findings on company information sources, impediments and planning will be included in a forthcoming OCAM report and will be reviewed in a future newsletter issue when available.

The full two days of discussion can be summarized in the following six priority items for action and attention.

- Personnel - There is a growing need to identify the source, education and training for personnel skilled in the CIM technologies.
- Economic justification - Many of the benefits of CIM come from strategic and intangible benefits not readily identified by traditional accounting methods. Hence there is a need for new justification and accounting procedures to be followed and supported with case histories. There is also a need to identify minimum risk models which companies may follow for evolutionary implementation.
- User pull - There is a need to create a stronger user pull and to couple the technology push capabilities of the CAD/CAM centres, supply industry and R&D community to it.
- Government role - While the work of the CAD/CAM Council has been successful in many instances, the Council is urged to undertake stronger action with respect to government.
- Coordination - There is a need for greater coordination and communication which would strengthen the capabilities and activities of the CAD/CAM centres.
- Small companies - There is a need to make the computer integrated manufacturing technologies more relevant and more affordable by small and medium sized enterprises.

The CAD/CAM Council has taken all of these suggestions under advisement and will endeavour to include them in its future activities as well as communicating them to others for consideration.

An index to the approximately seventy-five CAD/CAM and Robotics Development and Information Centres in Canada participating in the coordination meeting is available in the 380 page NRC publication number 24511. Copies are available for \$10 prepaid, to the Receiver General of Canada in English or French.

Contact: NRC Publications
National Research Council of Canada
Montreal Road
Ottawa, Ontario
K1A 0R6

3. International Comparisons

A plenary session paper at the June 1986 Canadian CAD/CAM and Robotics conference pointed out the difficulty (and near impossibility) of making meaningful international comparisons concerning CIM capability on a company to company basis. This is because of the great effort required to establish and survey representative industrial populations in the countries being compared.

The June 1986 issue of the publication "Manufacturing Productivity Frontiers" contains a feature article on international comparisons of a different nature from which the following data tables have been extracted. The data given are prepared annually on 12 industrial nations by the USA Bureau of Labor Statistics (BLS) and were presented for discussion at the CAD/CAM coordination meeting, item two above.

Interested readers are referred to the discussion and additional tables in the June issue of Manufacturing Productivity Frontiers, or to the BLS publication. It is important to note that all data are on a relative, not absolute base, referenced to 1977 and some, as noted, are referenced to the value of the U.S. dollar.

In summary:

- Table 1 - Shows that most countries experienced increased output in manufacturing; Japan most, the U.K. least with Canada near the middle.
- Table 2 - On the other hand, many countries (except Japan) experienced a decrease of employment in manufacturing. In Canada, and a few other countries, there was very little change.
- Table 3 - The output per employed person is one measure of labour productivity. On this measurement Japan leads with an increase of 56.2%. Canada lagged the twelve countries reported with an increase over the seven year time frame of only 9.1 percent.
- Table 4 - Compares changes in unit labor costs in manufacturing on a U.S. dollar basis. The U.K., U.S.A. and Canada had the three largest increases. The change was negative for some countries, due primarily to changes in exchange rates.
- Table 5 - Shows changes in international exchange rates, in this case relative to 1980. Note that some countries have experienced substantial changes between 1985 and 1986, although Canada has not.

Table 6 - For further comparison data are given, from other sources, of the ratio of R&D effort to GNP for some of the same countries. Data are for 1983, stated to be the latest year reported.

TABLE 1 - OUTPUT IN MANUFACTURING
Changes 1977 - 1984

	%
Japan	65.2
Denmark	20.6
United States	17.9
Italy	13.1
Belgium	12.8
Sweden	12.4
Netherlands	10.8
Canada	10.1
France	9.6
Germany	7.5
Norway	1.2
United Kingdom	-7.6

TABLE 2 - EMPLOYMENT IN MANUFACTURING
Changes 1977 - 1984

	%
Japan	5.8
Canada	0.9
Denmark	-0.4
United States	-1.0
Germany	-9.7
Italy	-11.1
Sweden	-11.6
France	-13.2
Norway	-14.2
Netherlands	-17.7
Belgium	-20.0
United Kingdom	-24.7

TABLE 3 - OUTPUT PER EMPLOYED PERSON
Changes 1977 - 1984

	%
Japan	56.2
Belgium	41.1
Netherlands	34.7
Italy	27.3
Sweden	27.2
France	26.3
United Kingdom	22.7
Denmark	21.2
United States	19.2
Germany	19.1
Norway	17.9
Canada	9.1

TABLE 4 - UNIT LABOR COSTS IN MANUFACTURING
U.S. Dollar Basis
Changes 1977 - 1984

	%
United Kingdom	43.9
United States	42.8
Canada	33.7
Italy	14.5
Japan	7.2
Germany	1.3
France	1.0
Norway	-0.3
Denmark	-11.4
Netherlands	-16.1
Sweden	-22.3
Belgium	-27.5

TABLE 5 - EXCHANGE RATE INDEX*
VALUE OF FOREIGN CURRENCY RELATIVE TO THE U.S. DOLLAR

Country	Index: 1980 = 100		
	1980	1985	May 1986
United States	100.0	100.0	100.0
Canada	100.0	85.6	85.0
Japan	100.0	95.0	135.7
Denmark	100.0	53.2	68.3
France	100.0	47.0	59.5
Germany	100.0	61.8	81.6
Italy	100.0	44.9	56.0
Norway	100.0	57.5	66.6
Sweden	100.0	49.2	59.2
United Kingdom	100.0	55.8	65.4

TABLE 6 - RATIO OF GROSS DOMESTIC EXPENDITURE ON RESEARCH & DEVELOPMENT
(GERD) to Gross National Product (GNP) 1983 data

U.S.	2.7%
Japan	2.61%
Germany	2.58%
Sweden	2.47%
Switzerland	2.28%
France	2.15%
Netherlands	2.03%
Canada	1.36%

Obviously many factors are at work and readers will wish to derive their own explanations to fit as much of the data as possible. An additional statistic not reported above would be the balance of trade data for manufactured end products, which for Canada had increased to a deficit in 1985 of \$17 billion dollars, according to 1985 preliminary estimates.

4. Workshop on Factors Influencing Integrated Circuit Design

The Canadian Microelectronics Corporation in Kingston, Ontario held their 1986 workshop June 4-6, 1986 under the title and theme "factors influencing integrated circuit design". The following summary of the presentations have been edited from notes provided by G. Puukila and D.J. Gale, Director VLSIIC at the CMC.

* Table 5. Source - Manufacturing Productivity Frontiers, July 1986.

In a summary of the past year's activities, presented by CMC staff, attendees were advised that the implementation program has expanded considerably: tighter scheduling, the use of allocation rules, the end of NMOS and the beginning of CMOS3 fabrication all took place in the past year. Since the CMC began its operations in January 1984, a total of 897 university designs has been processed. The design-rule checking (DRC) service, which has been in operation for 10 months, has been used to check 902 designs. In the future, the implementation program will be expanded to include larger package and die sizes, and a double-metal 3-micron CMOS process will be offered on a regular basis beginning in January 1987.

In the communications program, which is critical to the operation of the implementation program, approximately 61% of implemented designs and almost 100% of designs for DRC were received over a communications network. Three networks are now being used for information exchange: ENVOY 100, CDNnet and BITNET. Service will be improved with direct connections to CDNnet.

The equipment loan program was expanded to include the SUN-3/160 and the DEC uVAX GPX workstations. Test station support will include expansion of capacity and enhancement of the controller. Future efforts will concentrate on the supply of design and test software.

Additional papers and reviews were presented by invited guests from Memorial University, l'Université de Montréal, Waterloo University, Sun Microsystems, the University of Calgary, Bell-Northern Research, and MITEL Corporation.

The final day of the workshop was devoted to informal design review sessions, user group meetings and demonstrations of software tools developed at Canadian universities.

Additional details about the workshop can be found in the VLSI IN CANADA newsletter and are also available from the CMC in the form of a report (IC86-9) which is a collection of notes related to the workshop presentations.

Readers may also wish to note that the Fourth Annual Canadian Conference on Very Large Scale Integration (CCVLSI '86) will be held in the Queen Elizabeth Hotel in Montréal from October 27-28, 1986.

Contact: Gary Puukila
Canadian Microelectronics Corporation
Room 207, Carruthers Hall
Queen's University
Kingston, Ontario
Canada K7L 3N6

5. Book Reviews

"A Manager's Guide to Industrial Robots", Ken Susnjara, Prentice-Hall, 1982, 186 pp., softcover, price \$12.95.

As mentioned by the author "It is difficult to pick up a periodical or trade journal today that does not contain some reference to industrial robots". This makes the topic very timely.

The book's prime target is the introduction of industrial robots to the non-technical manager or upper management. I found most of the information well worded and very easy to understand. The reader is given a well rounded introduction to all major areas, ranging from what is an industrial robot, to how it will effect human relations in your facility.

The robot application and installation manual portion of the book is without a doubt the best I have seen in a long, long time.

In summary, I would recommend this book to all who are involved with, or who have an interest in industrial robots. It would also serve the academic world as a good introduction to the topic.

Reviewed by: M.P. O'Grady, CAD/CAM Manager, Bristol Aerospace Winnipeg. Mr. O'Grady, a former teaching master at George Brown College in Toronto, has been with Bristol Aerospace in CAD/CAM activities for the past six years.

6. CAD/CAM Publications Available

- "Canadian Manufacturing at the Crossroads"

In a special mailing to their MATFORUM members, the Canadian Manufacturers' Association have announced the availability of their new reference paper "Canadian Manufacturing at the Crossroads".

While the title of the publication is the same as the video tape announced in the June 1986 CAD/CAM Newsletter, this CMA report contains a considerable amount of new information in addition to that derived from the fact finding mission to Japan. New information includes a Gallup poll of Canadians to determine attitudes to current issues affecting the manufacturing sector and a series of executive forum discussions among senior manufacturing executives.

Excerpts from the executive summary of the report indicate its content:

- . Canada's competitive position has eroded due to the fact that real wages have outstripped real output
- . Persistently poor productivity will continue to lead to plant closures, bankruptcies and corporate reorganization.

- . Since Canadian manufacturers use a high proportion of imported components, the devalued dollar is not a competitive advantage.
- . Automated factories promise greater productivity.
- . Technology is leading to manufacturing facilities which are more flexible, better integrated and more automated.
- . New technology brings potential for substantial reductions in indirect and overhead labour costs, machine hours, set up time, total number of machines, work in progress, space utilization, improved quality and productivity.

Copies of the reference paper report are available to CMA members or non-members at a cost of \$15.00 each.

Contact: The Canadian Manufacturers' Association
Attention: Irene Desi
One Yonge Street
14th Floor
Toronto, Ontario
M5E 1J9

7. CAD/CAM Quotes

- "By any measure, Canadian manufacturers are not meeting the crucial need to adopt and integrate new technology. This issue is of deep concern to CMA's Manufacturing Advanced Technology (MAT) Forum.

All indications are that the difficulties range from awareness and understanding of new technologies to selection and financing of suitable hardware and software, as well as recruiting and training of appropriately skilled personnel. ---

- To survive the 1990's, companies must learn to accept rapid change as the new norm, adopting a more agile, responsive stance and forsaking the traditional ideas of using technology to substitute capital for labour, restructuring facilities on a piecemeal basis, trading off quality for cost, extending product life cycles indefinitely, ---
- There must be top management commitment to technological change and to the need to make production facilities part of the arsenal to gain strategic advantage.
- Companies will require more visioning, strategic thinking and planning for the future. Only by identifying and implementing the requisite strategies will they successfully steer themselves into this highly competitive environment ---
- There is a pressing need for creative, innovative, and visionary management, to be able to meet the challenges of change."

From the Canadian Manufacturers' Association Manufacturing Advanced Technology Forum (MAT FORUM) September 1986.

"Unlike traditional applications of computers in business, CIM's strategic nature requires a direct and ongoing involvement of top management in the process. ---

Many of the savings from CIM are from reductions in overhead, smaller inventories, better and faster information flow, reduced cycle times for design and manufacture and improved quality. ---

There is a misunderstanding in industry, that if you have a CAD/CAM graphics system you have CIM and should be able to reap all the benefits. CIM is much more than that. ---

If manufacturing disappears in Canada -- and the nation is forced to rely solely on the service sector -- will we somehow manage to maintain our high standard of living? Not likely! ---

A large and growing need for company or in-plant training is foreseen, first for managers and technical personnel, later for operational personnel."

From "Management in Crisis: Implementing Computer Integrated Manufacturing in Canada" a report by the Canadian CAD/CAM Council for the Advancement of Computer Integrated Manufacturing.

8. Twenty Selected Abstracts Provide a World View on CAD/CAM

For a review of CAD/CAM developments around the world, please refer to the selection of twenty abstracts in the section attached. These will assist your organization to meet both the management and technical challenges of computer integrated manufacturing.

9. This newsletter may be reproduced in whole or in part. Reprinting in other Canadian publications is encouraged. Acknowledgement to the Canadian CAD/CAM Council would be appreciated.

* Secretariat
Canadian CAD/CAM Council
Office of Industrial Innovation, 5th Floor Centre
Department of Regional Industrial Expansion
235 Queen Street
Ottawa, Ontario K1A 0H5

** Newsletter Editor
J. Scrimgeour
Division of Electrical Engineering
Bldg. M-50
National Research Council of Canada
Ottawa, Ontario K1A 0R6

Please note that requests for additions, deletions or changes to the newsletter distribution list should normally be directed to the secretariat.