

The University of Waterloo
**Management of Integrated
Manufacturing Systems**



Research Group for
Logistics and Manufacturing

The rapid introduction of new technology and the competitive necessity for flexible and quick response have increased the importance of integrating manufacturing, logistics, and other areas of the organization into an efficient and effective system. This requires a great deal of expertise and an understanding of the inter-relationships between organizational elements. Academic researchers can provide this expertise and understanding.

The WATMIMS Research Group was formed in 1984 to promote and coordinate applied studies involving industry and academic researchers in the areas of manufacturing and logistics. Projects undertaken by WATMIMS for industry partners are completed by one or more graduate students supervised by a faculty member(s). All WATMIMS researchers have access to computer systems, hardware, and software owned or developed by WATMIMS, and of course, to University of Waterloo systems and support.

WATMIMS' collaboration with industry partners typically begins with projects that study specific, partner-identified problems related to the management of integrated manufacturing systems (that is, systems that aim to successfully integrate all elements of manufacturing and logistics into an effective and efficient whole). The close association with the industry partner achieved through these projects frequently results in the identification of other, often more general, problems that require further research. Regardless of the length or depth of collaboration, the industry partner benefits from student and faculty expertise and experience in analyzing problems and issues related to their operations. In return, the industry partner covers the cost of supporting the graduate student(s), plus an overhead charge. Partner organizations also receive priority invitations to WATMIMS workshops and conferences, plus advance copies of the "WATMIMS Research - Executive Summaries for Industry."

Projects between WATMIMS and industry collaborators generally are over a time frame (typically eight to twelve months) that is longer than studies by traditional management consultants. As well, WATMIMS focuses on logistics and manufacturing topics where there is greater conceptual risk, and hence more payoff from the development of new ideas.

The WATMIMS Research Group is housed in the Department of Management Sciences. *Management Sciences* studies and analyses all aspects of management of organized systems, including operations, information, economics, behaviour, logistics, planning, and control. This breadth of research activity enables WATMIMS members to draw on the expertise of colleagues to provide fully-integrated solutions to modern manufacturing and logistics problems.

OBJECTIVES

The objectives of the WATMIMS Research Group are twofold:

To Conduct Applied Research in Conjunction with Industry Partners. This includes the development and application of tools and techniques for use in the management of integrated manufacturing and logistics systems, and the creation of new knowledge about the design, implementation, operation, and control of these systems. Included here are the important interfaces with purchasing, transportation, product/process design, inventory management and human resources.

To Provide Education and Training to Practitioners and Students. WATMIMS helps to educate and train both university students and industry personnel in the use of methods and tools for improving the management of integrated manufacturing systems. Day-long workshops for practitioners and on-campus luncheon meetings for senior industry personnel are held regularly to facilitate this objective. Students have the opportunity of being associated both with applied problem solving and basic research, thus enhancing their potential to become industry leaders in manufacturing and logistics.

ACHIEVEMENTS

Since its inception, WATMIMS has been actively engaged in projects with many leading Canadian companies, including General Motors, IBM, Imperial Oil, John Deere, Magna International, Manchester Plastics, NCR, Nortel Networks, Standard Products, and Stelco.

Research with industrial partners has included studies of the overall manufacturing or logistics system to diagnose reasons for difficulties and opportunities for improvement; system modeling (including computer simulation) to identify and test key factors that affect system performance; and development of decision support systems to assist in management decision making. Examples of past WATMIMS studies include:

- ! The use of optimization models to suggest vehicle routes and the location of distribution centres, for a third-party logistics firm.

- ! The development of a generic planning and scheduling system (WATPASS) to assist schedulers in small- to medium-sized job shops.
- ! The detailed study of issues in implementing Just-In-Time (JIT) in a manufacturing company, and on organizational issues related to supplier relationships.
- ! The creation of decision support systems for industry partners in manufacturing and distribution.
- ! The development of large computer simulations, for partners in manufacturing.

The following areas are of current interest to WATMIMS members:

- ! **Logistics and Supply Chain Management**, including integration of manufacturing and logistics decisions, supplier selection and development, analysis of multi-echelon inventory and logistics systems, supply chain transportation decisions, and competition and cooperation between supply chain members.
- ! **Manufacturing System Planning and Performance Evaluation**, including the coordination of multiple manufacturing cells, and the computational testing of scheduling of production operations.
- ! **Agile Manufacturing**, including operational and human issues related to methods (such as U-shaped lines and cellular production) aimed at improving flexibility and cost-effectiveness without sacrificing throughput benefits commonly found in assembly lines.

For further information on the WATMIMS Research Group, or to discuss collaboration between your organization and WATMIMS, please contact the director, Dr. James Bookbinder, at (519) 888-4013, or the research assistant, Bev Rodgers at (519) 888-4519.

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