Foreword

Manufacturing engineering has come a long way, from the “black art” in the 1800s to the first scientific analysis of machining operations by F.W. Taylor in early 1900s (On the Art of Cutting Metals, 1906). In the early 1950s, computers were developed to take control of machine tools and NC machines were born, and later, CNC machines. The 60s and 70s saw a rapid proliferation of software and hardware development in support of manufacturing operations in the form of design, analysis, planning, processing, measurement, dispatch and distribution. The late M Eugene Merchant, then Director of Research Planning of Cincinnati Milacron Inc., made an exciting Delphi-type technological forecast of the future of production engineering at the General Assembly of CIRP in Warsaw, 1971. Five years later, he made another report on the “Future Trends in Manufacturing – Towards the Year 2000” in the 1976 CIRP GA in Paris. He reported that between then (1976) and the year 2000, the overall future trend in manufacturing will be towards the implementation of the computer-integrated automatic factories. More than 30 years had since whisked past, manufacturing technologies had indeed progressed even more rapidly than Dr Merchant’s prediction then.

Manufacturing operations have changed from programmed operations to programmable operations. In the last two decades, many manufacturing operations and processes have become near autonomous, i.e. they possess sufficient intelligence to diagnose, optimize, decide and correct any actions with minimum human interaction. Some systems can acquire and learn from past cases and become increasingly more “learned” through usage. Machine tools which are Internet-enabled can be continuously monitored by their manufacturers and their “state-of-health” is exactly known and predictable to enable the reduction of breakdown time and to ensure timely maintenance. Computer-integrated Manufacturing (CIM) has evolved to become Computer-Human Integrated Manufacturing (CHIM). Seamless integration of human and computer intelligence is another measure to capture the perfect complementation between man and machine.

It is with great pleasure to witness this new book ‘Manufacturing Intelligence for Industrial Engineering: Methods for System Self-Organization, Learning and Adaption’ by Zude Zhou, Qinghuai Wang and Ping Lou. It is a timely capture of the state-of-the-art development of intelligent manufacturing processes, covering a vast amount of materials from design, planning, diagnosis, information control, agents, and many enabling platforms and supporting theories. I have, beyond doubt, that this contribution will be invaluable to researchers as well graduate students in the field of manufacturing engineering.

I sincerely congratulate the authors on having produced this splendid new book.

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A. Y. C. Nee received his PhD from the Victoria University of Manchester in 1973 and Doctor of Engineering (DEng) degree from UMIST in 2002. He joined the University of Singapore as a faculty member in 1974. He has held various administrative positions including Head of Department of Mechanical Engineering from 1993 to 1996, Dean of Faculty of Engineering from 1995 to 1998, other appointments include: Director of Office of Quality Management, Dean of Admissions, CEO of Design Technology Institute, Co-Director Singapore-MIT Alliance, Deputy Executive Director, then NSTB SERC, Director of Office of Research. Prof Nee received his National Day Award in Public Administration—PPA(P) in 2007. Professor Nee is well known in the field of manufacturing engineering. His research focuses on computer-aided design of fixtures, molds and dies, distributed manufacturing systems, AI and augmented reality applications in manufacturing. He was selected a Fellow of the Society of Manufacturing Engineers with citation in 1990, and a Fellow of the International Academy for Production Engineering (CIRP) in the same year. He was elected as Vice-President (Elect) at the CIRP recent senate meeting in August 2009, and will be Vice President in August 2010 and President of CIRP from August 2011. He has published over 250 papers in international refereed journals, 5 authored and 5 edited books. Professor Nee is regional editor of International Journal of Machine Tools and Manufacture, and International Journal of Advanced Manufacturing Technology. In addition, he is editorial board member and associate editor of another 20 refereed journals. He is also Chairman of an NUS spin-off company—Manusoft Technologies Pte Ltd established in 1997.