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**A KNOWLEDGE BASED APPROACH TO ASSIST IN THE
DESIGN OF A PERFORMANCE MEASUREMENT SYSTEM
FOR A MANUFACTURING ENVIRONMENT**

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ABSTRACT

As international competition has intensified, manufacturers have had to rethink their approach to the manufacturing activity in the factory. Companies are now recognizing the importance of defining strategic objectives based on current and future market requirements and by developing Performance Measurement Systems (PMS) consistent with these requirements.

The issue of appropriate performance measures is thus a very significant one to consider. Not only can performance affect the commercial success of manufacturing companies, but in the present economic climate, many manufacturers will be looking for appropriate information about their internal processes to establish ways of cost-cutting, of enhance performance and generally of building better products and services in a shrinking market.

The concept of performance measurement has been accepted, for some years now, as an essential part of World Class Manufacturing (Sellenheim, 1991) and the importance of measurement is well covered in the literature. However, methods for developing and implementing detailed measures adapted to the environment of a specific company are seldom described in detail (Ljungberg, 1994).

The work reported in the thesis contributes to the current understanding of manufacturing performance. It focuses specifically on designing and managing performance of a manufacturing unit from the corporate level to the shop floor level. It seeks to fill some of the gaps in the research by addressing three areas: steps in designing a PMS, frame work of PMS specific to a manufacturing environment and implementation of Knowledge Based (KB) systems, Gauging Absences of Pre-requisites (GAP) analysis and Analytic Hierarchy Process (AHP) approach in an integrated PMS. A Knowledge-Based Performance Measurement System (KBPMS) Model is developed that considers five levels of company performance: *Business Perspective*, *Customer Perspective*, *Manufacturing Competitive Priorities Perspective*, *Internal Process Perspective*, and *Resource and Method Availability Perspective*. The KBPMS Model integrates the managing of performance across these five levels through sequential questions that assess both qualitative and quantitative factors. The KBPMS Model is integrated with an AHP and a GAP methodology and thus both qualitative and quantitative aspects of the PMS are identified, and key areas of potential improvement in the PMS are identified for each application.

In order to be able to address the issue of manufacturing performance in detail, the research validation was confined to four industry sectors: aircraft component manufacturing, electronics manufacturing, computer and office equipment manufacturing and telecommunication products manufacturing. Some published case studies were also used to test several modules to check the validity and reliability of the proposed model. The results of the validation exercise indicate that the present KBPMS Model is a suitable decision-making tool to assist the practitioners of PMS and provides consistent and detailed results.