ABSTRACT

Keywords: Low Volume Automotive Manufacturing (LVAM), Lean Manufacturing, Knowledge Based (KB), Gauging Absences of Pre-requisites (GAP), Analytic Hierarchy Process (AHP)

The product development process for the automotive industry is normally complicated, lengthy, expensive, and risky. Hence, a study on a new concept for Low Volume Automotive Manufacturing (LVAM), used for niche car models manufacturing, is proposed to overcome this issue. The development of a hybrid Knowledge Based (KB) System, which is a blend of KB System, Gauging Absences of Pre-requisites (GAP), and Analytic Hierarchy Process (AHP) is proposed for LVAM research. The hybrid KB/GAP/AHP System identifies all potential elements of LVAM issues throughout the development of this system. The KB System used in the LVAM analyses the gap between the existing and the benchmark organisations for an effective implementation.

The novelty and differences in the current research approach emphasises the use of Knowledge Based (KB) System in the planning and designing stages by suggesting recommendations of LVAM implementation, through: a) developing the conceptual LVAM model; b) designing the KBLVAM System structure based on the conceptual LVAM model; and c) embedding Gauging Absences of Pre-requisites (GAP) analysis and Analytic Hierarchy Process (AHP) approach in the hybrid KBLVAM System.

The KBLVAM Model explores five major perspectives in two stages. Planning Stage (Stage 1) consists of *Manufacturer Environment* Perspective (Level 0), *LVAM Manufacturer Business* Perspective (Level 1), and *LVAM Manufacturer Resource* Perspective (Level 2). Design Stage (Stage 2) consists of *LVAM Manufacturer Capability – Car Body Part Manufacturing* Perspective (Level 3), *LVAM Manufacturer Capability – Competitive Priorities* Perspective (Level 4), and *LVAM Manufacturer Capability – Lean Process Optimisation* Perspective (Level 5). Each of these perspectives consists of modules and sub-modules that represent specific subjects in the LVAM development. Based on the conceptual LVAM model, all perspectives were transformed into the KBLVAM System structure, which is embedded with the GAP and AHP techniques, hence, key areas of potential improvement are recommended for each activity for LVAM implementation.

In order to be able to address the real situation of LVAM environment, the research verification was conducted for two automotive manufacturers in Malaysia. Some published case studies were also used to check several modules for their validity and reliability. This research concludes that the developed KBLVAM System provides valuable decision making information and knowledge to assist LVAM practitioners to plan, design and implement LVAM in terms of business organisation, manufacturing aspects and practices.

Supervisors: Dr. M. K. Khan, and Dr. K. Hussain