

Cranfield University

School of Applied Science and Engineering

PhD Thesis

Submission Academic Year 2011-12

L.E. Redding BSc, MSc, MIET

## **Integrated Vehicle Health Management (IVHM)**

**An enabler to the “Servitization” of companies within the  
Manufacturing Sector - A Model Approach**

### **Abstract**

Research Supervisor: Professor Tim Baines

The Global market, increased resource pricing, and evolving wage legislation have resulted in UK based manufacturing not being able to compete upon cost alone. More innovative approaches and evolving business models are required which enable 'whole life' revenue streams generated during 'in the field' product usage.

Integrated Vehicle Health Management (IVHM) is identified as a key enabler to the 'Servitization' of manufactured offerings and the adoption of a Product Service Systems business model. This application of sensor technology, artificial intelligence, and communication technology, enables integrated design and operations systems that provide real time information of products, sub-assemblies, and components during operation.

IVHM is evolving across industrial sectors, organisations, and academic institutions in silos. There is little understanding of its holistic growth, no bespoke methodologies to introduce the application to mainstream manufactured products, or means to assess the potential of its use to businesses.

The research aim is to map the high value IVHM applications in use within the UK and then create a simulation tool, or decision framework that will enable the evaluation of the potential benefits of new and alternative applications.

The research will satisfy key research objectives which include:

- A study of a broad range of industrial sectors, and the literature, to identify the state-of-the-art emerging, and failed, IVHM applications
- The Identification of factors which have enabled or inhibited the technical and commercial effectiveness of the application.

- The creation of a decision framework, (or simulation tool), that incorporates key factors and transforms them into business performance measures
- The validation of the decision frame work through case exemplars.

The research outputs include a state-of-the-art literature review including a full descriptive and thematic analysis supplemented by a survey, structured interviews, and case studies of mainstream UK based manufacturers producing complex products. This will offer holistic understanding of the applications, and penetration of the technology into the UK manufacturing base, whilst identifying the drivers and inhibitors to its adoption. The resultant gap analysis will inform the specification of the decision model to be designed and the key performance indicators to be employed.

Finally, the research will offer the decision framework, (or model), with relevant documentation and case exemplars.

This research is currently at the seven month stage and the thesis is due for submission in November 2011.