

Student Name	Jonathan Rees
Company	Rolls-Royce Plc
Research Uni	Queen's University Belfast
Academic Supervisors	Professor Mark Price Dr Joe Butterfield
Title	Systems Engineering for Risked Value Analysis in Through Life Services Management
Abstract	<p>The aim of this doctorate is to enhance the assured and profitable delivery of Through Life Services Management (TLSM) for Integrated Power System (IPS) services, by developing a more robust methodology for evaluating the forecast impact of risk. Against this aim, this doctorate shall explore applications of Data Mining and Design of Experiments, as applied to a new method of uncertainty modelling (Risked Value Analysis or RVA) using a Monte Carlo based Discrete Event Simulator.</p> <p>Over the last couple of decades, Rolls-Royce has evolved from a pure manufacturing company, into a services hybrid. At this time, service based contracts constitute more than half the company's revenue stream; in fact, Rolls-Royce's underlying service revenues grew to 55 per cent of Group sales in 2007, representing almost £4.3 billion (GBP), with an estimated value of over \$1 trillion (USD) over the next 20 years. Services are key to the future profitability and growth of Rolls-Royce, as well as many other companies that work in the aerospace sector.</p> <p>Over this same period, the traditional Rolls-Royce business model has evolved from one focused on aerospace, to the wider remit of power systems, inclusive of Marine, Energy, and Nuclear power markets. Indeed, the aerospace sector, which currently generates 80% of service revenues, is diversifying to consider the entire aircraft electrical system, as well as ground-based power systems. The entirety of these expanded services, which include anything from simple spares supply to full 'turn-key' capability solutions, are herein referred to as Integrated Power Solutions or IPS. This doctorate is therefore relevant to all medium to long term forecasts applied to design, aftermarket support, financial services, and management of IPS.</p>
Keywords	Systems Engineering; Risked Value Analysis; Rolls-Royce; Integrated Power Solutions; Through Life Services Management; Monte Carlo; Discreet Event Simulation; Agent Based Modelling; Data mining; Design of Experiments; Life Cycle Costing

<p>Aim</p>	<p>The aim of this doctorate is to enhance the assured and profitable delivery of Through Life Services Management (TLSM) for Integrated Power System (IPS) services, by developing a more robust methodology for evaluating the forecast impact of risk. Against this aim, this doctorate shall explore applications of Data Mining and Design of Experiments, as applied to a new method of uncertainty modelling using a Monte Carlo based Discrete Event Simulator.</p>
<p>Objectives</p>	<p>Develop the Proposed Method</p> <ul style="list-style-type: none"> A. Understand the existing method of TLSM B. Develop a novel yet standardisable method for the modelling of uncertainty, and consequently risk C. Establish the benefits and short-comings of Design of Experiments, as a means to evaluate 'cause-and-effect' in the context of TLSM forecasting, as based on a novel process for experimenting with risk forecast models D. Establish the benefits and short-comings of Data Mining, as a means to evaluate 'cause-and-effect' in the context of TLSM forecasting, as based on a novel process for data mining with risk forecast models <p>Prove the Proposed Method</p> <ul style="list-style-type: none"> E. Secure the appropriate level of technical capability (i.e. SCAF or similar) sufficient to test the value of the proposed novel method of risk forecasting F. Evaluate and justify the use of Data Mining, Design of Experiments, or some other technique, as a means to enhance the proposed novel method of risk forecasting G. Prove the value of the proposed method, versus the existing method, as a means to enhancing the assured and profitable delivery of TLSM for IPS services