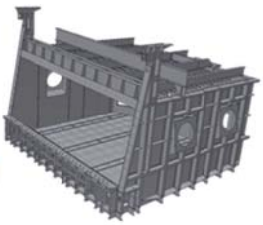
Rolls-Royce has subcontracted a design system work package on the TSB funded SILOET (Strategic Investment in Low Carbon Engine Technologies) project to the KBE team.

Description: Use of design automation to reduce the time required to conduct complex and interrelated computer based design systems work.

Knowledge Based Partnership (KBP). The Programme was setup to progress the company's strategic goal of achieving industry best practice in their emerging knowledge intensive design environment.

The KBP developed a roadmap, a process to provide information to make better technology investment decisions by identifying critical technologies and technology gaps within the current capability and identifying ways to move to a future requirement. http://www.rolls-royce.com/

Crash design/simulation modelling. This project used Knowledge Based Engineering to capture the design and engineering requirements, proving the principles for automatically generating a bi-directionally generative crash model directly from the design model, allowing for 76% time improvement per design iteration from traditional CAD/CAE processes.
http://www.morgan-motor.co.uk/



This Knowledge Based Partnership (KTP) programme was setup to capture engineering knowledge needed for the automatic generation of CAD component part models and assembly models of a static melting furnace based on the best practice rules captured from the engineering teams. The project demonstrated that the use of Knowledge Based Engineering for Initial Static Furnace Casing 3D modelling reduced the design engineering process time significantly by 97%. http://www.mechatherm.com/

This Knowledge Based Partnership (KTP) programme was setup to implement company-wide efficient processes supported by advanced information technology, delivering maximum productivity whilst releasing staff to address business critical issues enabling greater sales and profitability.

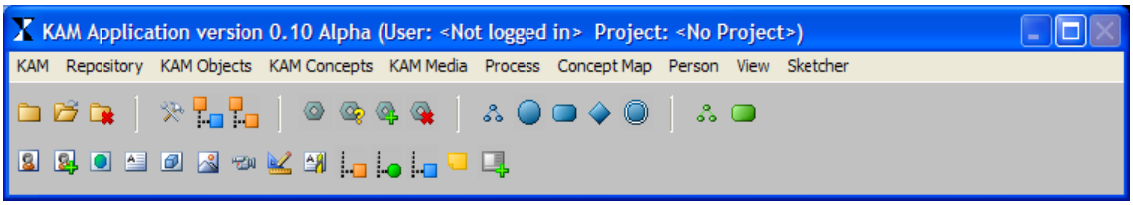
The adoption of SOA is of significant value to the company who now has a flexible information system able to evolve and support businesses more effectively and align agile business processes with dynamic market demands. The project is forecast to achieve more than £500K of tangible benefits for the company by 2013. http://www.mechatherm.com/

The objective of EuroTooling 21 was to change tool manufacturing from a resource driven process to a knowledge driven process. The project had 33 partners to create an Integrated Project funded by the European Commission in the period from 2004 - 2008.

Knowledge Based Engineering. This Research Activity was centred on the development of new tool concepts, with new technical solutions as well as new engineering postulates. The tooling industry is currently a highly empirical sector where knowledge is accumulated principally through industrial experience. The main aim here was to use new Knowledge Based Engineering technologies, to develop a generalised work methodology that systemises the acquisition and application of knowledge. http://www.eurotooling21.com/pgm/welcome.php

Knowledge Application Methodology for Knowledge Based Product Development Automation (KAM)

This project aimed to research, identify, evaluate and produce a novel integrated knowledge modelling methodology by the incorporation of a real time knowledge-modelling environment.



The project developed by understanding the knowledge management issues and gathered knowledge from the development of four applications, operations and cost modelling, material survivability system for armoured vehicle design, automated tool design and quoting system and a knowledge management tool for KBE application development. The project led to the creation of a tool for future development.

Automotive Knowledge Based Engineering Projects:-

Automatic Generation of Design Improvements by Applying KBE to the Post-Processing of FE Analysis (ADAM)

The need to consider a number of different alternatives at an early stage in design has been well established. Virtually all design projects include the need for some form of analysis often using finite element (FE) techniques. Yet in our traditional CAD environment the design stage is de-coupled from the analysis stage leading to long product design/analysis lead times. A significant improvement in effectiveness can be achieved if the concurrent engineering computational environment would have the ability to interpret the results from the analysis environment, and then use these inferences for automating, suggesting, or facilitating design modifications. There is also a problem with the method of feedback level and product/process representation necessary to enable automation of this process. By creating a feedback method shorter lead times should be created, enabling more design

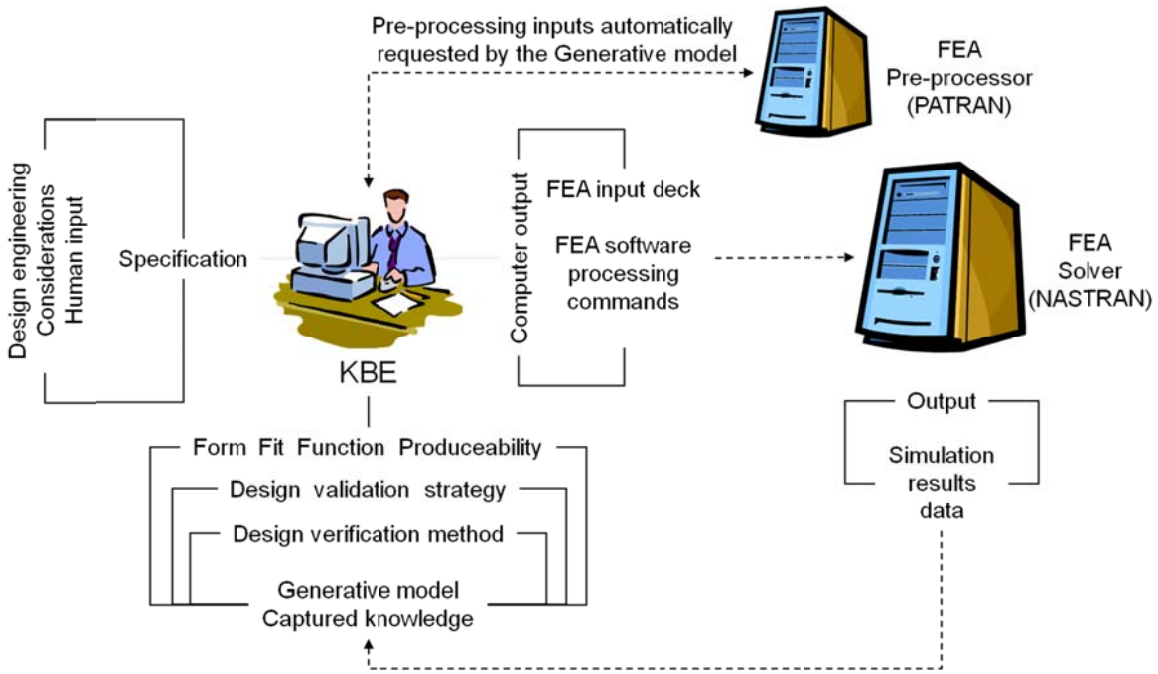
alternative and innovative ideas to be considered while maintaining competitive advantage.

Aims and Objectives

Aims: By the innovative use of Knowledge Based Engineering to automatically generate design improvements at the Post-processing phase of FE analysis. To improve competitiveness by establishing and disseminating knowledge of a new generic process enabler that will allow improved concurrency between the design and analysis of automotive components throughout the product cycle.

Specific Objectives:

1. To develop methods to allow the creation of automatic feedback from the analysis results to the KBE environment such that:
    a. The FE results for a demonstrator component can be taken into the KBE environment and queried.
    b. Automatic design changes or recommendations for the demonstrator component can be made based upon the rule sets for the design of the component.
    c. The analysis model is automatically updated and the component re-analysed if necessary.
2. To demonstrate that the post-processing of the design analysis can be automated using the developed methods. To demonstrate objectives 1 and 2 can be undertaken using PC's rather than having to use relatively costly workstations.



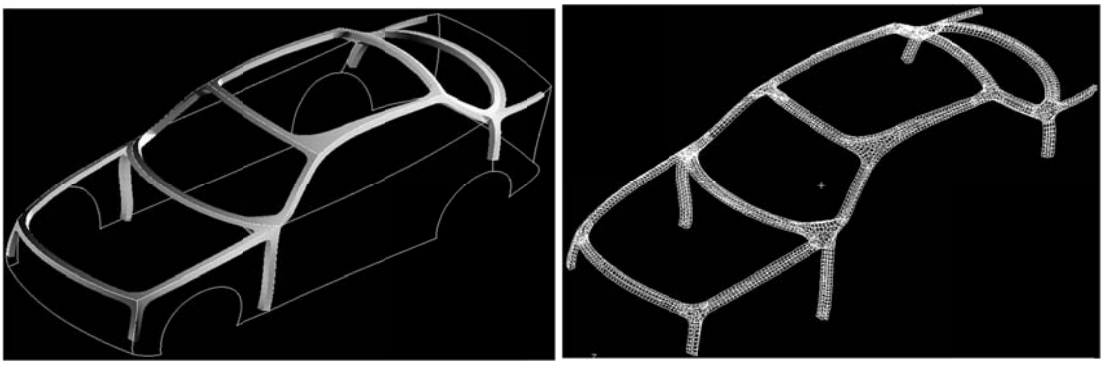
Automatic design / analysis feedback cycle – SALVO4b + ADAM

Structurally Advanced Lightweight Vehicle Objective 4b (SALVO 4b) Design Analysis Response Tool (DART)

This EPSRC/DTI project involved over 30 industrial collaborators and had two aims. To develop the technologies required to allow the UK automotive industry to gain a sustainable advantage and to aid future prosperity and growth for the industry.

The use of computing technology in the design of automobiles has been developing at an increasing rate. Such systems are currently used piecemeal and provide solutions to very specific problems. Understanding the vast amount of data and managing its flow through complex systems is extremely difficult without an integrated systems approach.

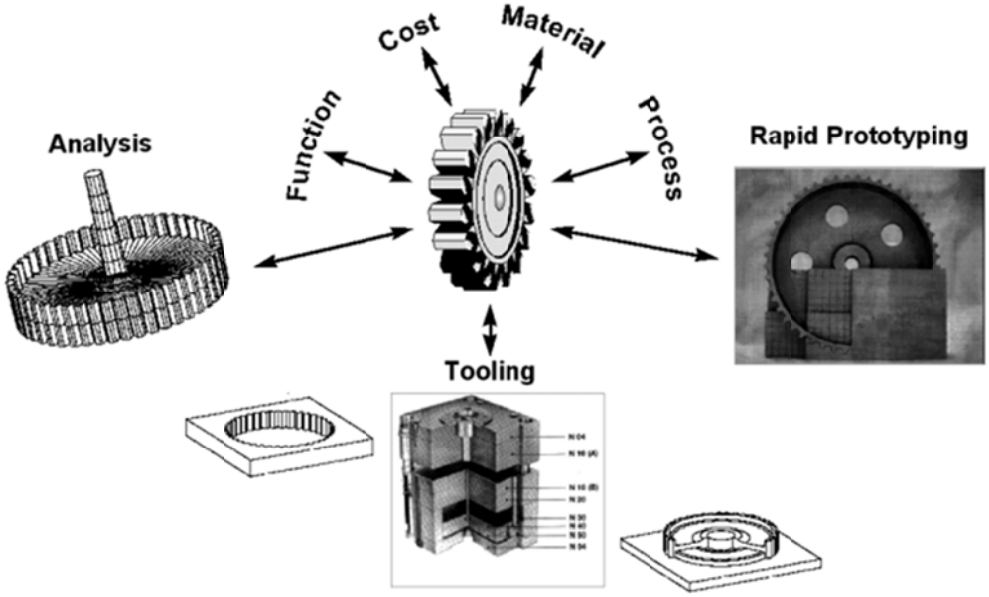
The approach developed by the KBPD team is the use of Knowledge Based Engineering (KBE) as a way of organising the data flow and an architecture for the effective implementations of design solutions. A specific challenge is the integration of concept design tools to allow the rapid development of novel design solutions. KBE, along with the supporting analytical solutions, is the basis of the program and the team has developed new methodologies for the automotive design and Body-In-White (BIW) processes as well as developing automatic pre-processing methods for analysis from a unified design model representation. These methodologies are of generic applicability beyond the automotive sector.



Feature based design environment with automated analysis model generation & design model automated redesign based on analysis results and captured design engineering strategies.

Engineering Polymers Integrated Capability (EPIC) (MP20032)

This DTI /Industrial funded project provided new technological solutions to six key work areas. These areas were, Concept design rules, design analysis, fast tooling and prototyping, high-volume non-destructive testing, in mould coating and recycling mixed materials. This multidisciplinary project demonstrated the ability to create a dynamic system that concurrently integrated the requirements and constraints of the design, analysis and manufacturing processes utilising commercially available software and a KBE methodology.



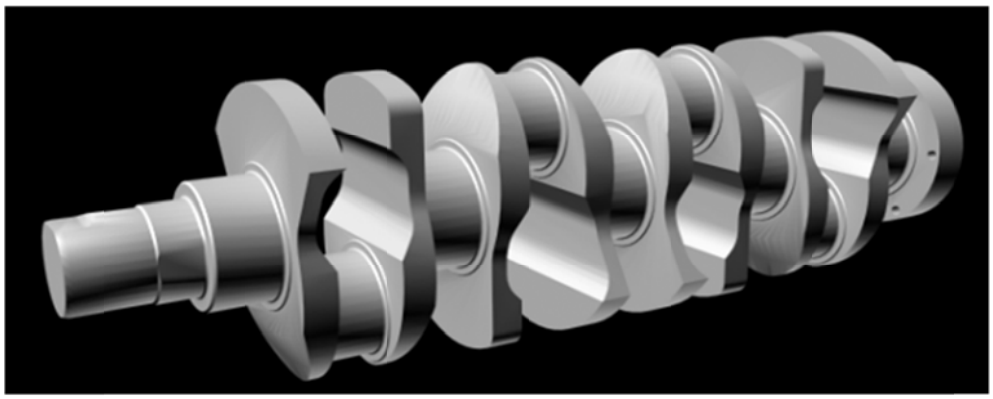
(Engineering specification automatically creates a solid model of the product and then simplifies the model for analysis. Tool bolsters automatically created and NC paths generated)

Automatic Crank Engineering (ACE)

This ROVER funded project had three aims.

1. To determine the feasibility of creating a generative crank model using a KBE methodology, within a short time scale using Rapid Application Development (RAD) techniques.
2. To explore the reuse of object classes within the product/process model and to integrate the application within an existing legacy infrastructure at the industrial collaborators site.

The project produced a working demonstrator within the specified time scales but highlighted the specialist skills required to meet the projects objectives when using commercially available Knowledge Based Engineering System (KBES) toolkits.



(Knowledge elicitation / system design / application development = 12 man weeks)