Research Project: Towards Sustainable Automobility – The Automotive Industry, Past, Present and Future.

Researchers: Researchers: Dr Paul Nieuwenhuis, Prof Peter Wells, Dr Lorraine Whitmarsh.

Background:
In trying to develop a complete understanding of the automotive industry, its technologies and its implications in terms of sustainability and future social, environmental and economic impacts, BRASS researchers have been engaged both in a historical reappraisal of the development of car production systems, to understand how the current state and future prospects of the industry are strongly determined by its strategic, structural and technical 'trajectory'. This and automotive futures work.

Aims & objectives:
- To analyse the historical development of automotive technologies and manufacturing systems to understand its evolution and the development of particular characteristics and constraints in terms of vehicle technologies, production volumes and supply chain structures;
- To evaluate the impact of past and current regulatory regimes on the development and nature of the industry;
- To undertake an analysis of likely future development scenarios for the automotive industry including the implications for future energy and materials demand.

About the research:
The historical element of the work by BRASS Researchers began before the Centre was established through engaged scholarship with industry during the 1990s, particularly in the area of car body materials; both conventional steel, and alternatives such as aluminium and composites, involving Corus, Alcan, GE Plastics, and others. From this work, an appreciation of the importance of the all-steel body in the economics of mass car manufacturing was developed. Later historical research led to an appreciation of the importance of the work of Edward G. Budd to the innovations that introduced this technology. For example, Ford seen hitherto as the father of mass car production, was unable to mass-produce car bodies for the Model T and hence to mass-produce complete cars as we understand it today. Budd's innovations allowed the mass production, for the first time, of complete cars, albeit at a very high investment cost which came to determine the economics of mass car manufacturing. Budd-related investments typically represent around 2/3 of the investments in a fully integrated, £1bn car assembly plant. Hence the term 'Buddism' was coined for the current mass manufacturing model, a term gaining increasing currency. Later work on this theme was carried out from 2001 under the aegis of the ESRC BRASS centre and focussed particularly on the US and France where manufacturers such as Dodge and Citroën pioneered these technologies enabling the spread of this paradigm.

The impact of public policy and regulation on the automotive industry and its sustainability has also been addressed in relation to the recent history of the industry through a project with AEA Technologies that developed a cost per car based analysis of environmental regulation over last 25 years. The role of policy and regulation and its impact on key stakeholders has also been central to an analysis of the roles and responses of key stakeholders in relation to responding to climate change. In 2006 much of the research at the time considering the state of the industry in relation to sustainability was drawn together in the edited book, "*The Business of Sustainable Mobility"* on behalf of the Greening of Industry Network. This integrated various strands of BRASS automotive

research (including research into Product Service Systems, localisation of production systems, driving behaviours and alternative fuels and powertrain technologies from Projects A1, 2 & 3).

There is also an emphasis on the likely future of environmental regulation of cars (and trucks), and this was explored in two reports published by TrendTracker on '*Car Futures: Rethinking the Automotive Industry – Beyond the American Model'* and by AutomotiveWorld on *'Low-Carbon Cars: Strategic Implications for the Vehicle Manufacturers'*. This futures research was also extended through a report on forecast global materials demand from the automotive industry for 2010, 2015 and 2020;

Results and outputs:
The work on the historical trajectory of the automotive industry had shown that growing capital intensity and the privileged position given to manufacturing economies of scale had resulted in a pattern of high risk, low return and chronic over-supply. This provides strong evidence that a radically different business model is needed for the industry and provides much of the core argument for the adoption of Micro-Factory Retailing (See A3).

The analysis of industry stakeholders in relation to climate change within the EU concluded that the relatively slow transition towards more sustainable low-carbon transport options and behaviours requires greater attention to be paid to the psychological, cultural and infrastructural factors affecting demand, better integration of policy measures to drive both supply-side innovation and demand-side change, and for more interdisciplinary analyses of mobility behaviours.

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- Nieuwenhuis, P. and Wells, P. (2009), *Car futures - rethinking the automotive industry beyond the American model*, Technical Report, Trend Tracker
- Nieuwenhuis, P. and Wells, P. (2003), *The Automotive Industry And The Environment: A Technical, Business And Social Future* (including a chapter on 'High volume car production: Budd and Ford'), Woodhead and CRC.
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Impacts achieved/potential for impact:
The automotive futures work has largely been industry sponsored and of significant interest to both companies and policy makers. The broad scope of the automotive research conducted by Prof Peter Wells and Dr Paul Nieuwenhuis in particular has been reflected in a wide range of publications in industry orientated journals including *Automotive Environmental Analyst, Municipal Engineer, World Vehicle Markets Analyst,* and *Automotive Emerging Markets on topics relating to alternative fuel technologies,* the UK car scrappage scheme, industry restructuring and European carbon reduction targets environmental regulation, lowering CO2 emissions and branding amongst other topics. They have also been involved in a series of webinars for practioners covering these topics, and have established Dr Paul Nieuwenhuis also has an advisory role for the OECD-ITF (international Transport Forum, formerly known as the European Convention of Ministers of Transport).