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Enabling University-Industry Collaboration to deliver High Quality and High Impact

Professor David Mullins

Director External & International Relations, WMG, University of Warwick, UK
About WMG

• **University of Warwick Manufacturing**
  – Research, Education, Implementation

• **World class research**
  – 90% world-leading/internationally excellent
    (HEFCE: REF 2014)

• **High Impact**
  – UK Lambert, Wilson, Witty Reviews of University - Business Collaboration

• **Improving skills base**
  – From school to postgraduate
The Role of Collaboration and Impact

• Engineering, technology and business are applied subjects – collaboration and impact at their heart

• Role to put knowledge in form that can be used

• Create tailored mechanisms ‘pathways to impact’ to enable exploitation - can’t leave to chance

• Focus on how a ‘customer’ can most easily absorb

• Partnerships, research, unique facilities, education, demonstrators and knowledge transfer
## Research Priorities

<table>
<thead>
<tr>
<th>Research Group</th>
<th>Lead Academic</th>
<th>Theme</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experiential Engineering</td>
<td>Cain</td>
<td>DESIGN</td>
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<tr>
<td>Visualisation</td>
<td>Chalmers</td>
<td>MATERIALS</td>
</tr>
<tr>
<td>Engineering Materials &amp; Manufacturing</td>
<td>Dashwood</td>
<td></td>
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<tr>
<td>Steels Processing</td>
<td>Seetharaman</td>
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<tr>
<td>Nanocomposites</td>
<td>McNally</td>
<td>Ceramics, Composites</td>
</tr>
<tr>
<td>Sustainable Materials &amp; Manufacturing</td>
<td>Kirwan</td>
<td>Metals, Polymers</td>
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<tr>
<td>Electrochemical Engineering</td>
<td>Dashwood</td>
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<tr>
<td>Net-Shape Manufacturing</td>
<td>Barnes</td>
<td>MANUFACTURING</td>
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<td>Metrology</td>
<td>Williams</td>
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<td>Automation Systems</td>
<td>Harrison</td>
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<td>Digital Lifecycle Management</td>
<td>Ceglarek</td>
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<tr>
<td>Energy &amp; Electrical Systems</td>
<td>Jennings</td>
<td>SYSTEMS</td>
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<tr>
<td>Propulsion Systems</td>
<td>Greenwood</td>
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<tr>
<td>Biomedical Informatics, Imaging &amp; Healthcare Technology</td>
<td>Arvanitis</td>
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<td>Cybersecurity</td>
<td>Watson</td>
<td>BUSINESS</td>
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<tr>
<td>Service Systems</td>
<td>Ng</td>
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<tr>
<td>Supply Chain</td>
<td>Godsell</td>
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User Engagement
WMG centre High Value Manufacturing Catapult
Institute for Digital Healthcare
Education Programmes
SME Programmes

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Research Landscape

Technology Readiness Level

<table>
<thead>
<tr>
<th>WMG Activity</th>
<th>WMG Staffing</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Driven</td>
<td>Academic Led</td>
</tr>
<tr>
<td>RCUK (EPSRC etc.)</td>
<td>Research Fellow</td>
</tr>
<tr>
<td>0-50% Industry Funding</td>
<td>EngD/PhD</td>
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<tr>
<td>10+ years to Implementation</td>
<td></td>
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<tr>
<td>Industry Driven</td>
<td>Project Manager Led</td>
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<tr>
<td>50-100% Industry Funding</td>
<td>Project Engineer</td>
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<tr>
<td>0-5 Years to Implementation</td>
<td>Research Fellow</td>
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<tr>
<td>Collaborative R&amp;D Driven</td>
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<tr>
<td>Innovate UK, Horizon 2020, HVM Catapult</td>
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<tr>
<td>5-10 Years to Implementation</td>
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<tr>
<td>TRL 1</td>
<td>TRL 3</td>
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</tbody>
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www.wmg.warwick.ac.uk
Unique Facilities – e.g. Energy Innovation

- UK Energy Storage R&D Centre: to enable battery scale-up and develop processes to take new chemistries from lab to power pack
- Research Council SUPERGEN Energy Storage
- UK’s ¥ 90m Spearheading Future Electric Vehicle Battery Production
- Enabling Electric Vehicle Land Speed Record holding Drayson vehicle
Unique Facilities – e.g. Autonomous Systems Simulator

Research Challenges

*Smart & Connected Vehicles*
*Wireless Networks*
*Autonomous Operations & Vehicles*

*Self learning Car Systems & Software Design Cybersecurity*

*Driver Distraction Virtual Decision Making In Vehicle Voice & Gesture Recognition*

[Diagram showing various components such as HPC, Data Storage, Vehicle Fleet, Motion Platform, Control System HIL, Infotainment System HIL, 3D Surround Sound, Simulator Control PCs, Buck/Drive-in vehicle, and different facilities related to research challenges.]

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Automotive Research

• Premium Automotive R&D Programme (PARD)
• Four year strategic programme including 170 supplier companies
• 17 research projects with wide dissemination through 2 skills projects
• Numerous implementations in existing and new vehicles
  – 295 New Products and Processes
  – 5,439 Learning Opportunities
  – ¥ 900M Additional R&D investment
  – ¥ 1.3bn Value Added
  – ¥ 300M Private Sector Leverage
Automotive Simulation Project: Partners

Coupland Bell
High Value Manufacturing Catapult

HVM Catapult provides access to world class assets and talent with co-location of engineers and scientists enabling cross-sector learning.

Uniquely it provides industry the ability to:

- Influence government investment in innovation
- Shape and drive the research agenda (UK & EU)
- De-risk investment in innovation
- Inspire, train and up-skill staff
- With sustained matched public funding
WMG centre HVM Catapult

• WMG is part of the UK government’s first Catapult as one of seven partners.

• Launched October 2011
  – ¥ 220M pa core funding
  – ¥ 220M pa industry match funding
  – ¥ 220M pa other UK / European funding

• WMG focus on Low Carbon Mobility (Automotive with Rail, Marine, Yellow Goods and Aerospace)
Advanced Propulsion Centre (APC)

- A £9bn commitment between UK Government and the automotive industry
- To Position the UK as a global centre of excellence in Advanced Propulsion
- WMG selected to host the Hub of the APC
- Initial collaborative research projects funded
- Skills programme scoped
The Institute of Digital Healthcare (IDH) is a co-funded collaboration programme between NHS West Midlands, WMG and Warwick Medical School.

Improve people’s health and wellbeing through the use of innovative digital technologies and methodologies.

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Education Innovations

- WMG Academy for Young Engineers - business-focused, business-led innovative school
- Innovative industry skills programmes – 30,000 awards
- Major programmes include
  - AstraZeneca, BAE Systems, Network Rail, Rolls-Royce, UTC Aerospace
- Technical Accreditation Scheme - 3,000 technology Masters modules taken by staff to date – 8 Universities
- Applied Engineering Programme - Online undergraduate programme for company staff
- Training banks on investment decisions in manufacturing e.g. Barclays, Lloyds, RBS and Santander
- Research Council Doctoral Training Centre / Engineering Doctorate
Hands On Education
Professional & Executive Programmes

• Intended to develop high-potential employees and to extend the capabilities of business managers / leaders
• Designed to be adaptable to meet the needs of the business and employee
  – Scale: single 2 ½ day module to a full MSc
  – Modules: typically 4 ½ or 2 ½ days in duration
  – Content: wide range of subject areas
  – Schedule: high degree of flexibility
Modules (2 ½ and 5 day)

**Business Modules**
- Business Awareness
- Commercial & Industrial Law
- International Joint Ventures
- Managerial Accounting & Control Systems
- Strategic Marketing
- Business Policy & Strategic Management
- E-Commerce
- Financial Analysis & Control Systems
- Financial Decision Making
- Global Business Environment
- Global e-Business
- Legal Aspects of Global Business
- Management of Change
- People in Organisations

**Operations Modules**
- Design Management
- Improving Business Performance
- Improving Manager Performance
- Industrial Engineering
- Logistics Planning
- Process Analysis
- Process Improvement
- Project Planning, Management and Control
- Quality Management
- Manufacturing Planning & Control
- Manufacturing Process Capability
- Supply Chain Management
- Total Productive Maintenance
- Working in Teams
- Applied Statistical Methods
- Business and Operations Design
- Collaborative Product Development
- Creating Business Excellence
- Design for the Environment
- Improving Personal Performance
- Innovation Strategy
- Knowledge-based Asset Management
- Leadership
- Leadership & Excellence
- Lean Principles & Application
- Logistics & Operations Management
- Managing the Multi-Project/Programme Environment
- Operations Strategy for Industry
- Process Improvement Using Six Sigma

**Technology Modules**
- Dimensional Management
- Information Technology
- Process Modelling
- Advanced Materials & Processes
- Automation and Robotics
- Enterprise Information Systems
- Information & Communication Technologies
- Machining Technologies
- Manufacturing Process Technologies
- Manufacturing Technology
- Materials Engineering
- Packaging

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Working with SMEs

• **20% - Late adopters**
  Awareness briefing, case studies, demonstrators

• **45% - Mainstream SMEs**
  Intensive company projects – prototyping, identifying markets, internships, product/service evaluation

• **25% - Leading edge SMEs**
  In-depth workshops, advanced demonstrations, horizon scanning, hands-on

• **10% - Feasibility to full R&D**
  Feasibility studies, collaborative projects assistance with funding / grant applications

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Collaboration and Impact: Automotive

- **Strategic Programmes:**
  - Tata Motors, Jaguar Land Rover and 300 suppliers
- **Pioneering aluminium:**
  - Jaguar XE/XF/XJ/F-Type & new 420kg lighter Range Rover
- Deliver over ¥ 4.5bn value-add
- Facilitate Jaguar Land Rover research and education
- JLR co-located 200 staff and Tata Motors, 300 staff at WMG
Enabling Growth

Design for manufacture and flexible tooling into Airbus A380

Construction as a manufacturing process with Persimmon – 50% improved energy consumption

Digital Innovation in Institute of Digital Healthcare and Academic Health Sciences Network

www.wmg.warwick.ac.uk
National Automotive Innovation Centre

• ¥1.3bn investment – one of the biggest private sector investments in any university
• A 33,000m$^2$ collaborative research environment
• Unique infrastructure and national focus for R&D addressing UK Automotive Council agenda
• Creating 1,000 and attracting 3,000 further R&D jobs
• Bringing global R&D of major Tier 1 suppliers to co-locate
Many options for partners

• Collaborative R&D in research consortia
• Company specific R&D for future products
• Strategic partnerships with third parties
• Exploration of new application sectors for products

• Specially tailored postgraduate education programmes
• Targeted staff recruitment / internships
• Engineering Doctorate – existing and new staff

• High profile physical presence
• Access to high quality demonstration / presentation facilities
• Co-ordinated relationship and shared publicity
Benefits to Collaboration include

• Funding for research infrastructure
• Funding for research programmes

• Generation of new ideas
• Sharing opportunities across education and research
• Case studies for education programmes
• Career destinations for students

• Collaboration and impact grows individual network and profile
• Collaboration and impact grow University profile and relevance

Thank You