Research Proposal: Advancing Sustainable Automotive Engineering in United Kingdom Manchester

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## Abstract

This Research Proposal outlines a critical investigation into the integration of sustainable manufacturing practices within the automotive sector, specifically targeting Manchester, United Kingdom. As the UK accelerates its commitment to achieving net-zero emissions by 2050, this study focuses on developing actionable strategies for Automotive Engineers operating in the Manchester ecosystem. The project addresses pressing challenges including supply chain decarbonisation, workforce upskilling for electric vehicle (EV) technologies, and leveraging Manchester's unique position as a Midlands manufacturing hub. This Research Proposal directly responds to UK Government priorities outlined in the 'Automotive Sector Deal' and aligns with the University of Manchester’s strategic goals for sustainable engineering innovation.

## 1. Introduction: Context & Significance

The United Kingdom's automotive industry, a cornerstone of national manufacturing, faces unprecedented transformation driven by electrification, digitalisation, and stringent environmental regulations. Manchester, as a key node within the UK's 'Northern Powerhouse' initiative and home to major engineering institutions like WMG (Warwick Manufacturing Group) and the University of Manchester’s Materials Innovation Factory (MIF), possesses significant potential to lead this transition. However, local Automotive Engineers encounter specific barriers: fragmented supply chains, skill gaps in battery technology, and limited access to regionally tailored R&D funding. This Research Proposal directly tackles these challenges by investigating context-specific solutions for Automotive Engineers working across Manchester's automotive cluster – encompassing Jaguar Land Rover’s Advanced Engineering Centre (near Manchester), Siemens Mobility operations, and emerging EV start-ups.

## 2. Literature Review: Gaps in Current Knowledge

Existing literature extensively covers global EV adoption trends and battery chemistry advancements but lacks granular analysis of regional implementation challenges within the UK’s specific industrial geography. Studies by the Society of Motor Manufacturers and Traders (SMMT) highlight Manchester's role in advanced manufacturing but note a critical shortage of Automotive Engineers with expertise in circular economy principles for automotive components. The UKRI’s 2023 'Net Zero Industrial Strategy' acknowledges regional disparities, yet no focused research has examined how Manchester’s unique infrastructure – including its proximity to renewable energy sources (e.g., tidal projects in the Mersey) and its strong digital tech sector – can be leveraged by Automotive Engineers. This gap impedes the efficient translation of national policy into localised engineering practice within Manchester.

## 3. Research Objectives

This Research Proposal establishes three primary objectives specifically tailored to the United Kingdom Manchester context:

1. **Identify Regional Supply Chain Vulnerabilities:** Map critical material dependencies (e.g., lithium, cobalt) for automotive manufacturing in Manchester and develop resilience strategies for Automotive Engineers.
2. **Assess Skills Development Needs:** Conduct surveys with 50+ local Automotive Engineers across Manchester-based firms to define the precise technical competencies required for net-zero vehicle development in the UK context.
3. **Design a Manchester-Centric Innovation Framework:** Co-create with industry partners (e.g., Tata Technologies, AVL List) an implementable model for sustainable automotive engineering that integrates renewable energy sourcing and local circular economy pathways.

## 4. Methodology

The research employs a mixed-methods approach grounded in Manchester’s industrial reality:

* **Phase 1 (Months 1-4):** Primary data collection via structured interviews with Automotive Engineers at Manchester-based facilities (JLR Advanced Engineering, local EV component suppliers) and analysis of regional supply chain data from the Centre for Logistics & Supply Chain Management (University of Manchester).
* **Phase 2 (Months 5-8):** Quantitative skills gap analysis using an online survey platform targeting all Automotive Engineer roles within Greater Manchester’s automotive sector, cross-referenced with UK government competency frameworks.
* **Phase 3 (Months 9-12):** Co-design workshops with key stakeholders (WMG, Business Manchester, UKRI) to develop and validate the Innovation Framework. This framework will be tested via a pilot case study at a selected Manchester manufacturing facility.

## 5. Expected Outcomes & Impact

This Research Proposal anticipates delivering three significant outcomes directly benefiting the United Kingdom Manchester automotive ecosystem:

| Outcome | Target Beneficiaries (Manchester) | Impact on Automotive Engineers |
| --- | --- | --- |
| Sustainable Supply Chain Toolkit | Local Manufacturers (e.g., GKN Driveline, Bentley Motors Manchester) | Reduces operational carbon footprint by 15-20% via optimised material flows; enhances engineer's strategic decision-making. |
| Skills Development Blueprint | Engineering Universities (UMIST, Manchester Metropolitan), Training Providers | Curriculum updates aligning with UK government 'Green Jobs' targets; career pathways for Automotive Engineers. |
| Manchester Innovation Framework (MIF) | All Automotive Engineers in Greater Manchester | Clear roadmap for implementing circular economy principles; increased competitiveness in UK net-zero contracts. |

## 6. Significance to the United Kingdom & Manchester

This Research Proposal is not merely an academic exercise; it is a strategic intervention for the United Kingdom’s industrial future. By focusing on Manchester, it directly supports the UK Government’s 'Levelling Up' agenda and targets the sector responsible for 15% of UK manufacturing exports. The outcomes will position Manchester as a demonstrable model for sustainable automotive engineering within the UK, attracting further investment through initiatives like the £1.8bn Net Zero Innovation Fund. Crucially, it empowers Automotive Engineers – the technical workforce driving this transition – by providing them with regionally validated tools and competencies, moving beyond generic national guidelines to address Manchester’s specific economic and environmental landscape.

## 7. Conclusion

The automotive sector in the United Kingdom Manchester stands at a pivotal moment. This Research Proposal provides a targeted, actionable framework to overcome localised barriers hindering the adoption of sustainable practices, directly enhancing the capabilities and impact of Automotive Engineers operating within this dynamic region. By grounding innovation in Manchester’s unique industrial fabric and aligning with UK policy imperatives, this project promises significant contributions to both academic knowledge and practical industry advancement. We seek funding from UKRI (Innovate UK) to execute this vital research, ensuring Manchester remains a leader in shaping the future of automotive engineering within the United Kingdom.