

# NORTHWEST AUTOMOTIVE SUPPLY CHAIN REVIEW

Report on cluster  
analysis undertaken  
for NAA

December 2008

Dr J S Srai  
Institute for Manufacturing  
University of Cambridge



# Executive Summary

*This report summarises the outputs from the supply chain investigative studies undertaken for the NW Automotive Alliance (NAA) by the Institute for Manufacturing (IfM), University of Cambridge in 2008.*

*The main objective of the work was to provide inputs to the NAA on the supply chain issues facing the regional cluster as part of a wider NWDA/NAA supply chain improvement and strategy development process.*

*The programme of work involved;*

- *A review of recent studies on the NW automotive cluster, and more broadly, UK automotive Supply Chain improvement initiatives e.g. current NAIGT activity*
- *A series of workshops with members of the North West Automotive Alliance (NAA) cluster association, initially to identify the challenges and opportunities facing NAA firms, to rank the priorities areas identified in terms of importance and finally to share the analysis and findings from these reviews and fieldwork studies*
- *Face-to-face interviews and site visits to key primes and tier 1's in the region*
- *Development of data collection instruments in the form of a detailed questionnaire and supporting analysis frameworks*
- *A concluding workshop involving the sharing of findings with NAA members and how they may influence NAA strategy development*
- *Review sessions with NAA and NWDA staff to support the NAA strategy development process and defining of strategic priorities.*

*All elements of the work, by their very nature involved co-development and support of NAA staff and cluster association members. Their active engagement and positive response to the process and outputs has been vital to the delivery of this report. The NWDA team have equally supported the development of this study, providing detailed feedback throughout, both in terms of content and group feedback in the various workshops.*

*This summary report is presented in the form of three sub-sections;*

- *Identification of priority issues and their relative importance to NAA members*
- *Findings from fieldwork interviews and questionnaire data (vehicle manufacturers and tier 1's)*
- *Emerging strategic priorities and input to implementation planning.*

*The findings in this report have been shared and agreed with the NAA team, having been initially discussed in the industrial cluster workshop end November 2008, and meetings with the NAA and NWDA team during inputs to their formal strategy development process, in December 2008.*

*At an executive summary level, the following main findings are drawn against each of the main enquiry strands, with supporting data included in the body of the report;*

**Identification of priority Issues:** *The investigative approach has generated a set of priority issues, their importance ranked by key NAA members, related to;*

- *the changing strategic context,*
  - *Key business and operational functions internationally dispersed*
  - *Tier 2's are largely located outside the region*
  - *Overseas markets key to growth*
- *supply chain capabilities that require operational support and process-maturity development, including*
  - *lack of regional innovation strategy*
  - *Tier 1's need to upgrade business processes to meet needs of VMs*
  - *Major skills deficits at graduate engineer and snr. technician level*
- *gaps in understanding on supply network structure that may impact future cluster configuration development, including*
  - *limited understanding of material/revenue flows in/out of the region*
  - *potential for joint-VM supply and infrastructure projects.*

**Findings from fieldwork studies:** *The review of company supply chain data from fieldwork has identified;*

- *insights on network structure including,*
  - *A traditional X-shape demand-supply structure across VMs*
  - *distinctive value-chain footprints of firms in terms of span of control*
  - *significant variations in regional/national value-add of VMs implied*

- from the data on material/revenue flows*
- *industry structure changes are largely driven from global firms restructuring impacting local firms span of activities, but also from new models, technologies and materials*
  - *Location advantages/disadvantages*
    - *local-factors broadly neutral except for skills availability*
    - *Regional/National-factors generally negative due to weak supplier base*
  - *Barriers to growth*
    - *largely firm specific factors dominate but concern about scale*
  - *Environmental challenges and opportunities*
    - *regional volume-mix presents sensitivity to legislation impacting demand of luxury models.*

#### **Emerging strategic priorities:**

*Four regional strategic priorities emerge from these study findings;*

1. Supporting the regional sector through the current economic situation
2. Enhancing current supply chains through efficiency improvement projects
3. Developing future value chains to target high-growth potential segments
4. Environmental initiatives targeting improved use of resources and climate change

Recommendations supporting these strategic priorities require;

1. The development of a co-ordinated regional and national response to mitigating effects of sharp consumer demand reductions (although not a focus of this report, this is vital to sustain current scale of operations)
2. Plugging skill (and activity) gaps through supply chain capability development programmes (suppliers and VMs), and exploring cross-company opportunities (e.g. Supplier parks, infrastructure projects)
3. Value chain analysis involving future industrial value chain scenario development and mapping), plugging value chain gaps – infrastructure, design, build, service, and exploiting new/emerging technologies. Regional development initiatives are recommended across innovation/technology, energy, and infrastructure underpinned by relevant University collaborations supporting High-Value Manufacturing.
4. Projects specifically targeting environmental challenges including programmes to improve efficient use of

resources and understand implications of meeting climate change challenges.

Further inputs to strategy development and action planning are included in Section 3.

#### **Concluding remarks:**

The structure of the report is set out in the contents section; each sub-section includes an introductory background setting out the objectives and approach taken, followed by findings from the study.

This executive summary has set out the objectives of the study, and the primary outputs including

- Firm and Tier 1-level Cluster supply chain challenges and priorities
- Findings in terms of key sector strengths and weaknesses,
- Improved understanding of the Strategic Context, elements of the regional Supply Chain Structure and development of Supply Chain Capabilities
- the emerging strategic priorities to be addressed and initial plans for their further development.

#### **Acknowledgements:**

We would like to thank the following organisations for their input and support;

- Northwest Automotive Alliance staff
- NWDA Advanced Manufacturing Group
- NAA Members who participated in rich workshop discussions in March, May and November 2008
- The major VMs and tier 1's (NAA members) in the region who provided data and valuable insights as part of face-to-face interviews and questionnaire data
- IfM students who participated in questionnaire development and data collection.

This report is submitted to the NAA and includes aggregate data provided by NAA members.

For reasons of confidentiality detailed information about individual companies has been generalised or presented in aggregate form.

**The report has a restricted circulation.** Further distribution of this report is at the discretion of the NAA.

# Contents

## NORTHWEST AUTOMOTIVE SUPPLY CHAIN REVIEW

Report on cluster analysis undertaken for NAA

<b>1. Identification of Priority Issues</b>	<b>5</b>
1.1 <i>Background and Aims</i>	5
1.2 <i>Approach</i>	5
1.3 <i>Priority Issues</i>	6
1.4 <i>Main findings</i>	7
1.5 <i>Post Workshop clustering of the issues facing the cluster</i>	8
<b>2. Findings from Fieldwork Studies</b>	<b>9</b>
2.1 <i>Approach to fieldwork studies</i>	9
2.2 <i>Key findings - network structure</i>	10
2.3 <i>Key findings - capabilities</i>	15
2.4 <i>Location factors</i>	17
2.5 <i>Barriers to growth</i>	18
2.6 <i>Environment</i>	18
<b>3. Supporting the Development of a Regional SC Strategy</b>	<b>19</b>
3.1 <i>Background</i>	19
3.2 <i>Strategy Support - Review Process and Specific Inputs</i>	19
3.3 <i>Emerging Strategic Priorities</i>	20
3.4 <i>Further Development and Communication</i>	21
<b>Appendix A - List of Emerging Sector Issues</b>	<b>22</b>
<b>Appendix B - 12<sup>th</sup> May 2008 Workshop Participants</b>	<b>23</b>

# 1. Identification of Priority Issues

## 1.1 Background and Aims

The strategy for supporting the Northwest automotive manufacturing industry over the last five years has been based on recommendations from a series of key sector reports on the NW Automotive Industry, including most recently the NAA Cluster Mapping Study (2007). Subsequent work, by the Institute for Manufacturing, University of Cambridge, has aimed to consolidate and integrate findings from these studies, prioritise key issues requiring action, and identify areas where further supply chain analysis was required in order to inform future regional strategy. Following review of previous studies in 2007, and a workshop in November 2007, a list of 20 priority issues for the NW Automotive cluster were identified.

The aim of the workshop held on 12th May 2008 was to review the initial cluster development issues identified with a broader and more representative group of NAA company members, identify the emerging issues requiring action, and to prioritise them from both company and regional viewpoints. In support of the next stage of analysis, the different perspectives from key tiers of the supply chain were to be captured. The results from this workshop are set out below, and were used to inform the structure of the company based case-reviews within the Northwest automotive industry scheduled for q2 and q3 2008.

## 1.2 Approach

The following approach was used to determine the priority issues facing NAA members;

### Identification of issues

Issues emerging from recent automotive sector industry reports, together with a review of the academic literature on the challenges and opportunities facing the industry were used to provide inputs to a mini-workshop of NAA/NWDA representatives. The mini-workshop was used to consolidate the regional perspective on the priority issues identified in the literature, and to provide opportunities for workshop participants to add specific issues they felt had not been captured.

The recent sector reports that informed the collection of issues included the following:

1. The Regional Automotive cluster mapping report (Strategem Consultants, 2002)
2. UK Automotive Innovation and Growth Team report (2002)
3. NAA 2007 Automotive cluster mapping review (2007)
4. UNIDO/MBS report (2007)
5. BERR initiated UK based Japanese supplier report (2007)

The updated list of issues considered for prioritising are set out in Appendix A. The authors of this report were also part of related initiatives (e.g. NAIGT 2008/9 review of UK Automotive supply chain competitiveness) enabling an up-to-date UK perspective on the UK Automotive sector.

### Workshop Participants

A representative group of NW Automotive firms participated in the identification and prioritisation workshop in May 2008: these spanned the main Vehicle Manufacturers (VM), major Tier 1 suppliers (T1), Tier 2 suppliers (T2), and Institutional respondents (e.g. NAA, NWDA staff). A full list of participants is provided in Appendix B.

### Ranking the priority Issues

The priority issues previously identified were reviewed to confirm importance and whether new issues had emerged. The issues were then ranked to provide input on which areas to focus action plans, and prioritise further those areas that needed further analysis. Table 1 summarises the results of the workshop, with the aggregate 'scores' reflecting the five priorities of the various workshop participants.

### 1.3 Priority Issues

Table 1 summarises the priority issues in order of overall importance, with each of the columns representing the following;

- Importance attributed from a company and regional perspective from Vehicle Manufacturers
- Importance attributed from a company and regional perspective from Tier 1's
- Importance attributed from a company and regional perspective from Tier 2's
- Importance attributed from a company and regional perspective overall
- c -r captures the major differences in perspectives between firms and regional considerations
- vm-t1 captures the differences in perspectives between vehicle manufacturers and tier 1 firms.

**Table 1. NAA Workshop issues – scores by importance**  
(sorted by aggregate (grand (g) total) scores)

	VM		Tier 1		Tier 2		Total		g	c - r	vm-t1
	Co	Re	Co	Re	Co	Re	Co	Re			
3 The UK image of manufacturing is poor and has an impact on the availability of skilled labour	4	5	4	4	1	1	9	10	19	-1	1
14 There is a perceived lack of collaboration between universities and automotive companies	3	6	5	4	0	0	8	10	18	-2	0
8 There is a lack of technically capable and skilled graduates/technicians fit for industry purposes	4	3	3	2	0	0	7	5	12	2	2
4 Public sector initiatives are fragmented, bureaucratic and often duplicated	5	4	0	0	1	0	6	4	10	2	9
10 Business strategy and processes need improving at tier 1 and 2 levels in the sector	3	2	4	0	0	1	7	3	10	4	1
20 Regional logistic capabilities and infrastructure appear to be poor	4	4	0	0	0	0	4	4	8	0	8
18 The reasons for UK supplier growth/decline are not fully known (quality, cost, delivery)	0	0	4	3	0	0	4	3	7	1	-7
12 There is a lack of lean implementation in tier 1 and 2 suppliers	2	1	2	0	0	1	4	2	6	2	1
5 There is a perceived lack of UK government response to competitive pressure and innovation	1	1	1	1	1	0	3	2	5	1	0
7 There is little in the way of a strategic approach for process and product innovation	1	2	0	1	0	1	1	4	5	-3	2
9 There is a lack of clarity on what are the major skill gaps in the manufacturing industry	1	0	0	3	1	0	2	3	5	-1	-2
16 The linkages in the value chain are unknown and there might be potential for Just In Time	1	1	2	1	0	0	3	2	5	1	-1
1 The future of key commodities (materials and processes) is not known	0	0	1	1	1	1	2	2	4	0	-2
15 The flows in and out of the region between OEMs, 1st tiers and 2nd tiers are not clear	0	0	0	2	0	0	0	2	2	-2	-2
17 There are unrealised aggregation and outsourcing opportunities	1	0	0	1	0	0	1	1	2	0	0
2 There is little (government) support for key technology commodities (e.g. carbon fibre)	0	1	0	0	0	0	0	1	1	-1	1
6 There appears to be no meaningful strategic approach to environmental legislation	0	0	1	0	0	0	1	0	1	1	-1
13 There is no definitive Northwest supplier database	0	0	1	0	0	0	1	0	1	1	-1
11 The unique competitive advantages and skills of the Northwest are unknown and hidden	0	0	0	0	0	0	0	0	0	0	0
19 There are unrealised service supply chain opportunities	0	0	0	0	0	0	0	0	0	0	0

The issues are clear and action plans should follow immediately (RED)  
 A broader value chain analysis would be of benefit (AMBER)  
 Further supply network analysis is required (GREEN)

The issues themselves are colour-coded depending on the nature of the issue under review with red representing implementation does not require further analysis, amber suggesting a broader value chain analysis would be of benefit, and green suggesting a more in-depth analysis of the supply chain was required.

The issues with greatest consensus were;

- The UK image of manufacturing is poor and has a (negative) impact on the availability of skilled labour
- A perceived lack of cooperation between universities and automotive companies in the NW
- There is a lack of technically capable and skilled graduates/technicians fit for industry purposes
- Public sector initiatives are fragmented, bureaucratic, and often duplicated
- Business strategy and processes need improving at tier 1 and tier 2 levels in the sector

Other key observations were that there were some significant variations in perspectives emerged depending on whether the respondents were companies, regional bodies, VMs or suppliers, e.g. company level requirements, e.g. the need to improve business processes especially tier 1's and 2's, firms suggesting the need to develop a regional innovation strategy. Similarly some differences in perspectives also emerged on public sector initiatives which appear to focus exclusively on the major vehicle manufacturers.

## 1.4 Main findings

Areas of greatest priority emerging from the analysis were;

- Skills deficit at the graduate engineer and technician level in the NW, although limited granularity as to which specific skill areas are in short supply
- Tier 2's are increasingly located outside the region
- Logistics infrastructure projects are of particular interest to Vehicle Manufacturers; but appear not to be a significant issue for Tier 1 companies (both large and small)
- Innovation is seen as well managed at a company level (especially VMs) but regional innovation capability perceived as a weakness with weak university links and no regional strategy
- Vehicle Manufacturers are exposed to many public sector national/regional initiatives (which are highly fragmented); Tier 1's are generally not involved (feel excluded)
- Flows in/out of the region understood at the company level (VMs) but no clear picture at regional level (particularly important for Tier 1's who have multiple customers)
- Vehicle Manufacturers require Tier1's to upgrade their business processes; Tier 1's accept requirement for business and operational process upgrading.

These observations captured the main findings from the review process, integrating previous inputs and assigning of priorities from an NAA workshop participant members perspective. (A more detailed commentary and review of some of the key elements emerging from the analysis of specific workshop outputs have been reported separately<sup>1</sup> and are available.)

There were some surprises for areas scoring low on company priorities; for example views on the need for a Regional Marketing Strategy (; this may be more of an RDA institutional agenda) and Service Development (may reflect the absence of dealerships, and repair centres from the respondent group) whilst reported as a key issue were not ranked as of high priority.

The findings were used to inform the scope and detail of the follow-up company interviews, the results and analysis of which are reported in Section 2 of this report.

---

<sup>1</sup> NAA Workshop Minutes of Meeting - 12<sup>th</sup> May 2008



## 1.5 Post Workshop clustering of the issues facing the cluster

The outputs from the May 2008 workshop provided some guidance to the issues in terms of their strategic context, observations on cluster structure (or elements of configuration), and needs for operational process-capability development (core competencies). Beyond the more recent economic downturn in major global markets that have particularly impacted the automotive sector, the following issues were identified;

### Strategic Context

Perceived lack of UK government response to competitive pressure and adverse local factors

The future of key commodities (availability of current materials and new materials/processes) is not known

There is little (institutional) support for key technology commodities (e.g. carbon fibre composites)

The UK image of manufacturing is poor and has a negative impact on skill availability

Public sector initiatives are fragmented, bureaucratic and often duplicated

### Capabilities

It is difficult to take innovations (product and process) from concept to market

Lack of technically capable and skilled graduates/technicians fit for industry purpose

Top level analysis has identified major skill gaps; action plans are required to identify and meet future needs

Business strategy and processes need improving at tier 1 and 2 levels in the sector

Core competencies of the Northwest need capturing, documenting and promoting

There is a lack of lean implementation in tier 1 and 2 suppliers

Company implementation strategies for environmental legislation are fragmented (driven by low awareness and skills)

### Configuration

There is no definitive Northwest supplier database

There is a perceived lack of collaboration between universities and automotive companies in the Northwest

The flows in and out of the region between OEMs, 1st tiers and 2nd tiers are not clearly mapped

The potential linkages in the value chain need capturing; there may be potential for Just In Sequence component manufacture and supply

There are unrealised sector aggregation and outsourcing opportunities e.g. NW supply hub, specialist chemicals management etc

### Capability and Configuration

The reasons for UK supplier growth/decline are not fully known (quality, cost, delivery): what are the key success factors for future business?

There are unrealised service (supply chain) opportunities

Regional logistic capabilities and infrastructure appear to be poor



## 2. Findings from Fieldwork Studies

### 2.1 Approach to fieldwork studies

The approach undertaken for the fieldwork element of the Supply Chain study was to engage and visit the principal vehicle manufacturers in the region, a selection of the major tier 1's and a few tier 2 suppliers. The face-to-face interviews involved semi-structured interviews with each participating company, involving site visits by the IfM (supported by NAA/NWDA where appropriate), and subsequent data analysis. Findings and emerging strategic priorities were then tested in a NAA workshop (end November 2008) to further build consensus on the findings and supporting evidence.

This process required the development of a comprehensive questionnaire addressing the range of issues identified earlier in Section 1 of this report, but with an aim to also provide an overview of the structure of the regional supply chain. This highly structured part of the data collection was further supported by more open questions to explore issues that might influence future regional strategy.

#### Questionnaire Development

The development of the questionnaire by the IfM, takes a supply chain perspective of the cluster using inputs from related IfM research. The development of the questionnaire involved the generation of a number of exploration strands emerging from the supply chain literature, and the incorporation of the supply chain issues identified in Section 1, specifically those issues identified as requiring further data.

The overall structure of the questionnaire, integrating regional and sector specific aspects related to the issues identified in Section 1 is shown below;

#### Structure of Data Collection Template

Section	Question Numbers
Background and Contextual Factors	1-8
Internal Business Processes and Core Competencies	9-14
Supplier Growth/ Decline and Procurement	15-28
Future	29-31
Innovation and Skills	32-37
Others Processes	38-46
Service	47-48
Emerging Industry Trends	49-55

The data collection targeted the capture of information related to specific questions exploring elements of;

- strategic context in which firms operate,
  - markets, product sectors, intra-firm activities, outsourced activities, scale
- the supply chain process capabilities of firms
  - capability maturity profiles against key supply chain processes
- supply network structure and configuration.
  - Supplier tier structure,
  - geographical dispersion, regional and national material inflows/outflows,
  - partner relationships.

### Fieldwork Case Studies - Companies interviewed

The following companies participated in the fieldwork elements of the review, involving on-site discussions, interviews requiring completion of a detailed questionnaire, and participation in workshops reviewing regional data at an aggregate level.

- Vehicle Manufacturers
  - Bentley Motors
  - General Motors - Vauxhall
  - Jaguar Landrover
  - Darwen Goup (now part of the larger Optare Group)
- Suppliers
  - Bosal
  - CHK Engineering
  - Electron
  - Futabo Teneco Limited
  - Getrag Ford Transmissions
  - Mitras Automotive

The questionnaire was used to structure these company based interviews. The review of data at an aggregate regional sector level was undertaken in well attended workshops involving the remaining key vehicle manufacturers (e.g. Leyland Trucks) and other key suppliers.

### Analysis Methods

The issues under investigation, themselves emerging from reputable literature sources, were set out in terms of a number subject areas to ensure the subsequent treatment of the data was straightforward.

Each question on the survey instrument presented to (busy) industry respondents addressed a specific subject area under investigation, with data capture of a qualitative nature taken at interview (usually involving multiple respondents from the operations management team), and other data captured off-line. Some additional questions were included to explore targeted enquiries and 'open' questions introduced to capture trends and potential drivers not emergent from the literature review or pilot-testing of materials.

The questionnaire<sup>2</sup> provides for multiple factors to be compared and is supported by a data template that allows for additional firm data to be added and comparative analysis tables to be easily generated. Questions addressed supply network structure, supply chain capabilities, location factors, barriers to growth and environmental considerations. The key findings from these broad subject areas are set out below.

## 2.2 Key findings - network structure

### Selected dimensions of network structure

The questionnaire tackled several questions regarding selected 'structural' or configuration<sup>3</sup> elements of the automotive sector in the Northwest.

In this summary report observations are made in five key areas, namely;

- Tier structure (typical volume vehicle manufacturer)
- Value chain/supply chain footprint of major firms
- The inflows/outflows from the region and nationally
- The importance of Service operations
- New developments that are likely to change industry structure

Additional areas of structural change were also investigated but data-sets were either inconclusive or incomplete, or as in the case of cost and revenue flows present confidentiality concerns and have not been included in this summary report.

---

<sup>2</sup> Questionnaire and other data collection instruments prepared by the IfM – for further details contact Dr J S Srai, IfM.

<sup>3</sup> The definition of supply chain configuration is as defined in the paper 'A Supply Network Configuration Perspective on International Supply Chain Development', J. S. Srai and M.J. Gregory, Int'l Jou of Operations & Product'n Mngm't, 2008

### Supply Network Tier-Structure

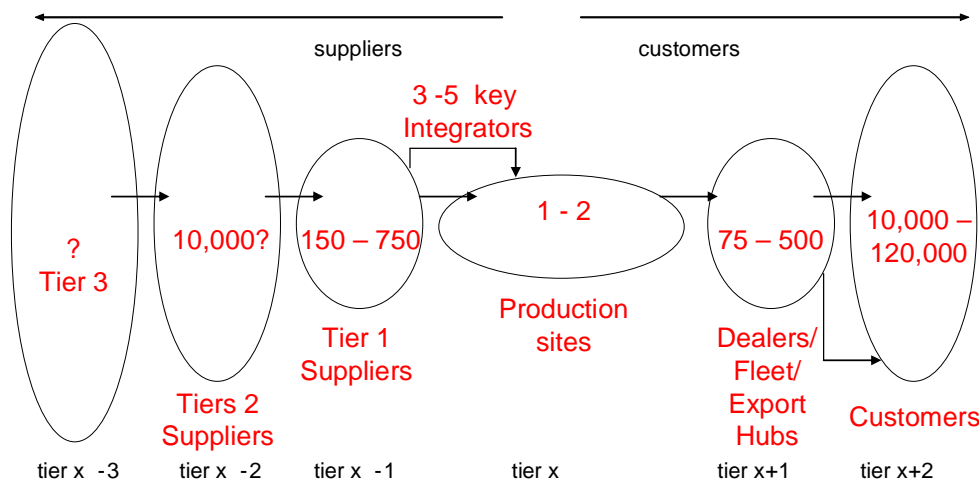
As shown in the schematic below (Figure 1), the supply network tier structure of the major regional vehicle manufacturers represent a traditional 'X' Shape footprint, with single/dual production sites in the region being the focal-point for a complex and dispersed supply network.

The dependency of suppliers on the main vehicle manufacturers demonstrates the critical role OEMs have in cluster development and future scale. Whilst not surprising, the region benefits from several global players located in the region and suggest cross-company synergies should be explored.

Although not shown at this aggregate level (Figure 1), the geographically dispersed nature of suppliers and customers emphasise the 'international' dependency of the sector with many tier 1's and tier 2's of the major vehicle manufacturers located overseas, and the majority of customers being international. Although data is limited at tier 2 and beyond, many tier 2 firms no longer operate exclusively as automotive sector players and dependencies include other major manufacturing sectors.

Local/on-site 'supply chain integrators' play a major role within supply chain operations, an area worthy of further research, with some spanning several Vehicle Manufacturers. They may be a source of potential regional advantage in terms of building scale, competencies and efficiency.

The location of Tier 1's appears to vary considerable between the Vehicle Manufacturers, and may limit local supplier park development and scope. A joint VM study on supplier park potential is likely to generate real opportunities for development of scale Tier1's, perhaps plugging gaps in the regional supply chain, and an effective forum is required to facilitate these discussions. The regional value-add inferred by the geographical spread of sourcing locations, manufacturing locations, and markets supplied are discussed further later in this section. The data suggests 'niche sector' players whilst often smaller in overall revenue terms may have an understated contribution to regional value-add.



### **The Supply Chain of VMs have a traditional 'X' shape 'footprint'**

- **with single/dual Production-sites in the region**
- **Local Integrators span several VMs - potential source of regional advantage?,**
- **T1 location varies and may limit supplier park potential; sponsor joint-VM gap analysis**

Figure 1 - Supply Network Tier Structure

### Value Chain Supply Chain footprint

Figure 2 set out the 'activity map' of the major regional automotive firms against key 'value chain' stages of research and development, design, supply management, distribution or routes to market, and the operations associated with after-sales services.

For a particular firm, each stage of the value chain (blue chevron) represents an activity or process that is located regionally or nationally in the UK (in this case represented by a small red chevron), or is undertaken in the firm but as a non-UK activity (red chevron in brackets) or is an outsourced or insignificant activity (no activity shown). The schematic also captures key linkages between value chain stages (as a red ellipse) where close coupling between these value-chain stages is highly desirable.

The chart demonstrates the very-different value chain footprints of key firms in the region; where Regional or UK activity is present (and where it is not), and where close linkages across value chain stages are seen as vital for successful operational and R&D product integration.

The traditional categorisation of the sector by volume, or vehicle type, whilst relevant, does not bring out these linkages and where value-addition takes place. The analysis suggests an alternative classification covering span of influence, identifying value-adding stages and inter-dependencies between functional operations. Alternative firm-classifications, for example those firms actively involved in design, may provide opportunities where collaborative working (e.g. across non-competing sectors) can provide significant know-how transfer, and the promotion of skills-development at Universities where combined scale provides the critical mass for more vocational course development.

Where linkages between value-chain stages are seen as important, for example the location of design operations, or local-integrators, provide insights into more tailored regional support initiatives that focus the development of skills relevant to these activities. This may support the retention (or extension of) of more value-add activities regionally and the proactive resolution of skill gaps, leading to the development and promotion of regional competencies.

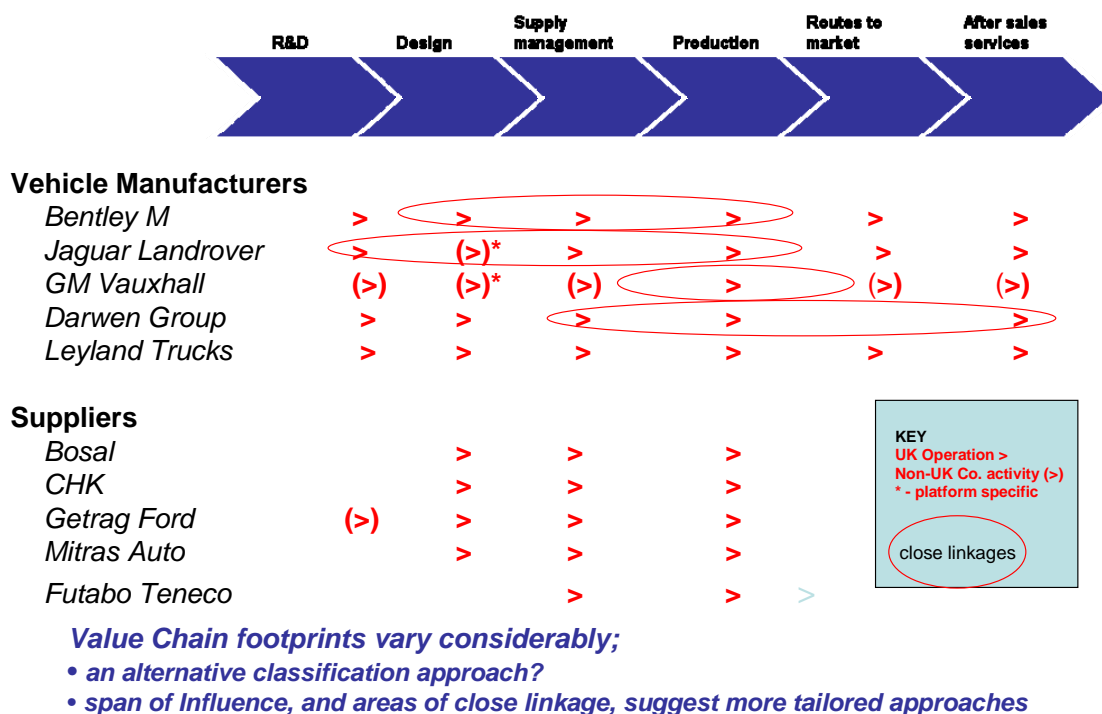


Figure 2 - Value Chain / Supply Chain Footprint

**The inflows/outflows from the region and nationally**

Figure 3 sets out the key inflows/outflows taking a regional and national perspective of material and revenue flows.

The chart demonstrates the high variation in

1. tier 1 procurement supply locations of the vehicle manufacturers (representing VM inflows)
2. the differing market destinations of finished vehicles (representing VM outflows) and
3. the different scale of the major OEMs (relative scale in revenue terms).

Procurement (inflows of VMs): Regarding procurement sourcing locations, these appear to vary significantly between firms and suggest very different make-up of regional/national component by firm of their final vehicle costs.

Market Destinations (outflows of VMs): Finished goods data has shown how internationally dependent the region is with exports dominating volumes (other than in the case of niche vehicles). In the case of higher-end/luxury car models some three quarters of vehicles are exported with a key market being the USA.

The inferred value-addition both regionally and nationally when integrating these dimensions, i.e. comparing across firms the aggregate view of the three inflows/outflows/scale factors, (the combined data excluded from this report for reasons of confidentiality)) suggest that the value-add regionally and nationally varies significantly. The business model of some firms involve providing basic 'assembly' type activity whilst others operate a more extensive national supply chain supplying overseas markets. The value-add concept can be a key dimension in understanding contribution to wealth creation.

Whilst the profile of tiers 2 feeding tier 1's is another factor to be taken on board, and out of scope in this study, these value-add considerations should be a key factor in development of the regional sector strategy, the potential impact of intervention policies and the potential benefits of particular support initiatives.

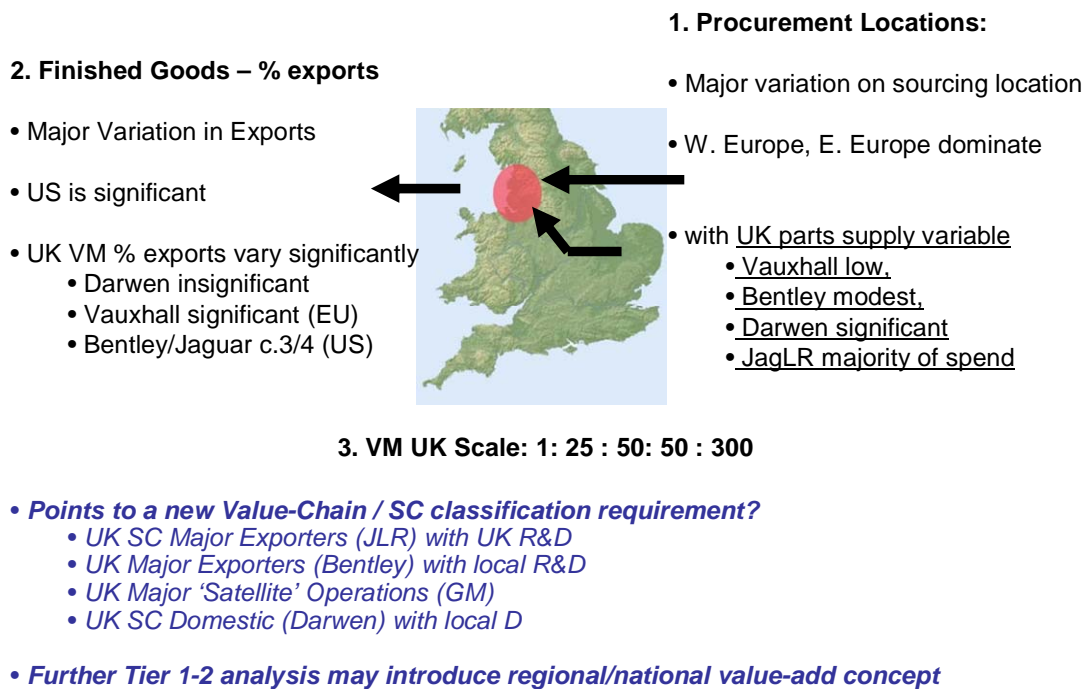


Figure 3 - Inflows/outflows

**The importance of Service Operations**

The importance of after sales services in the future development of the strategy was included as part of the broader review process. Despite its identification as a priority issue, a relative low priority ranking amongst operations managers prompted further exploration.

The interview responses suggest all major vehicle manufacturers (each denoted by alphabetical letter in the chart below) indicate after-sales services are critical, with opportunities identified also for service providers and suppliers to provide more by moving into adjacent areas of the value chain.



What are the opportunities for developing the after sales service business?

- 1 - An emerging strategy
- 2 - More primary car sales, and branded parts
- 3 - Suppliers providing more ! - e.g. body shop?

*Moving downstream is the favoured strategy - after sales seen as critical*

Figure 4 - Importance of after-sales services?

The international dimension of overseas markets, becoming more dispersed year-on-year as developing and emerging markets become attractive, also presents challenges in how best to integrate an after-sales service network. (In the case of one of the major vehicle manufacturers, a large proportion of their vehicles remain operational several decades after initial sale, and service revenue represents a growing income stream. The development of a more integrated service model is worthy of further research.

### New developments likely to change industry structure

Several themes on potential discontinuities to the cluster were explored (see Figure 5 below).

The company respondents were asked 'what are the new developments that are likely to fundamentally change your sector?' The review included focus on upstream activities (new technologies, new materials) and potential changes to partnering arrangements with suppliers and customers.

Responses suggest that significant activity in Mergers & Acquisitions, or Disposals present particular firms with significant restructuring issues, and where these are relevant are the major points of discontinuity.

Regarding new technologies, there was general consensus on lightweight materials and low-carbon technology adoption although for several firms this involved drawing on R&D departments located overseas.

Regarding supply chain related issues, Vehicle Manufacturers reported further opportunity for greater just-in-sequence (JIS) operations. The potential for supplier-park development, for firms supporting multiple VMs remains an attractive proposition, with significant VM interest, although mechanisms for sharing 'local' procurement do not exist and present an opportunity for NAA to lead on.

The importance of overseas markets, including emerging and developing nations, suggest new sales models may emerge as operations become more dispersed and dynamic, and the need to compensate for lack of an established sales infrastructure.

<i>New technologies</i>	Carbon reduction, Hybrid vehicles, new fuel technologies
<i>New materials</i>	Lightweight Materials e.g. Aluminium , Carbon Composites
<i>New partnering arrangements</i>	Developing JV or Contract Manufacturing Overseas Move to more of a systems integrator overseer role thru aggressive outsourcing e.g. paint-shop
<i>Alternative supply chain structures</i>	New Service Models, Integration through M&A, Modularisation may allow for outsourcing Expand JIS production operations Life after de-merger, Reducing volume base
<i>Alternative routes to market</i>	New Service Models facilitated through lease/finance options; New markets New ways of selling e.g. No dealers? China?; Retail Parks, Internet

Figure 5 - New Developments and Potential Discontinuities

A potential contribution to sector development is the drawing up of scenarios against these potential discontinuities described above, and assessing their likely impact. Strategies required to exploit these changes would include proactive development of emerging technologies and business models. The mapping of these emerging industry structures, identifying key enablers is recommended.

### 2.3 Key findings - capabilities

A review of supply chain capabilities amongst the major vehicle manufacturers and tier 1's (the 10 interviewed firms discussed earlier) was conducted with some broad high level questions on their assessment of their capability level (i.e. the 'maturity' of their formal operational processes).

#### Supply Chain process maturity

Firms provided information in terms of the capability-maturity, or sophistication of their organisations supply chain processes.

A surprising spread of responses were received across six core operational areas. The data suggested significant opportunities for improvements in planning & forecasting, inventory management, and cross-enterprise integration.

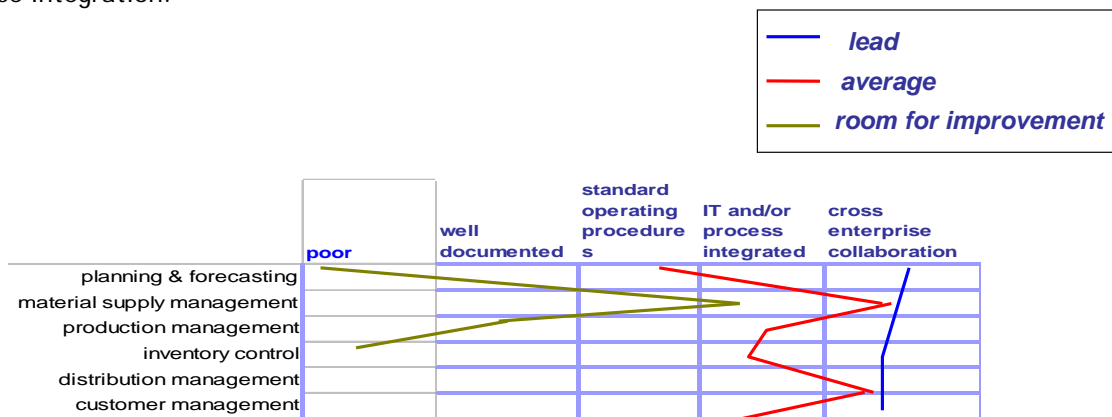


Figure 6 -SC Process Maturity

A regional/national supply chain capability development programme that addresses these gaps is called for; one approach would provide for mechanisms for leading firms to 'champion' particular processes where they have advanced process-capability, an approach successfully deployed in many automotive clusters. The picture amongst Tier 1's was particularly mixed calling for a targeted supplier development programme.

#### Adoption of Lean management processes

A review of the adoption of lean management processes amongst the leading firms in the region suggested few examples of proficiency or leading edge practice but that process-maturity was generally at awareness levels only. The recent initiative (lean Academy) provides an opportunity to roll-out leading practice across all VMs/major tier 1's in the region. Initiatives on supply chain process improvement can be part of a more comprehensive supply chain capability development programme as discussed above.

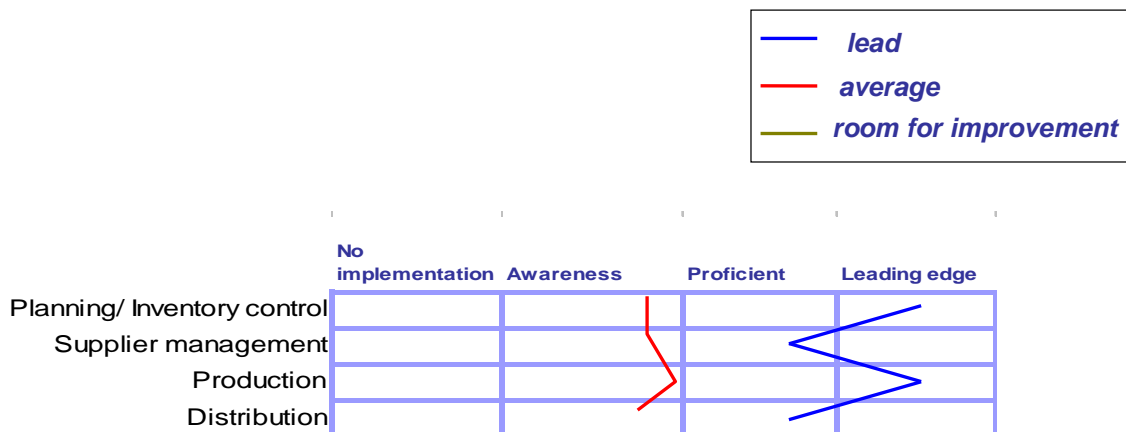


Figure 7 - Adoption of Lean Management Processes



### Firm competitive advantages

As part of the semi-structured questions on firm competitive advantages, five principal areas of business competition were explored to identify what key competitive approaches were being used by leading Vehicle Manufacturers.

Figure 8 below summarises what organisations regarded as their competitive advantages in the fields of technology, cost, quality, time and flexibility.

### What would your organisation regard as its competitive advantage in the fields of technology, cost, quality, time and flexibility?

<b>Technology</b>	Applying proven technology for local UK market; Fast follower strategy, Access to 'parent' capabilities; skills in interior design, styling Terrain response technology Leverage on 'parent' hybrid technology
<b>Cost</b>	Exchange rates may make this plus or minus - uncompetitive with E. Europe
<b>Quality</b>	Quality is a weakness in the sub-sector of the industry with a QC rather than QA focus Quality is very favourable in terms of finish and functionality Favourable.
<b>Responsiveness</b>	Lack of forecasting processes, partly due to heritage as bespoke manufacturer Not an issue - 'customer expects to wait', 98% OTIF, customer care needs to be fast response Can use 'parent' logistics infrastructure; speed to market of new product intro's
<b>Flexibility</b>	Transition from bespoke supply to standardised offerings Flexibility is vital to accommodate spec changes quickly and in-house and for New Product Introductions Two shifts utilised only!

Figure 8 - Firm Competitive Advantages

As part of the development of a supply chain capability development programme, activities should seek to integrate the competencies of leading practice firms across the region where practicable, and address gaps in skill sets reported above.

In some areas, technology and process transfer will not of course be appropriate, being fundamental to competitive strengths or intellectual property. However, several development areas or gaps identified above reflect generic supply chain processes where regional capability can benefit the sector as a whole e.g. supplier quality management processes, supplier capability development, operations management education and training.

## 2.4 Location factors

### Local factors

Local location-factors (near or adjacent to production site) covering skills, labour, transport, land and community relations were explored with the firms interviewed.

Results from these questions relating to local factors are summarised in Figure 9 (letter-symbols represent individual firm responses, with aggregate position signified by line-profile (red)).

Overall local-factors were seen to be broadly neutral, neither representing strong positives or negatives. The one exception to this was 'skills availability' which was seen as negative or strongly negative. Additional questions in this area suggested that the most pressing skill gaps were for specialist graduate engineers and senior technicians and some demand for procurement/supply management resources.

The skills deficit in overall personnel numbers appears relatively small – representing the need for a cohort of several dozen engineers on an annual basis. In addition, restructuring (M&A, or de-mergers) were likely to generate resource demand peaks of significant scale, particularly when particular functions require wholesale change.

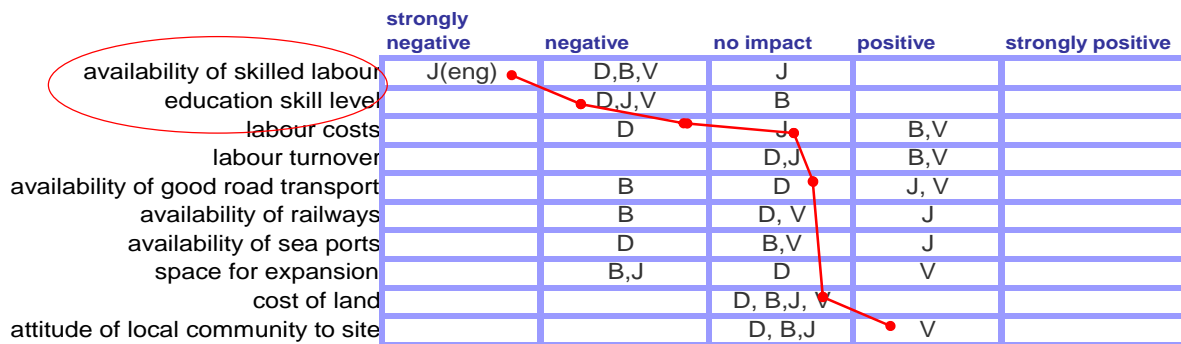


Figure 9 - Location Factors impacting firms - at a Local level (letter-symbols represent individual firm responses - aggregate position in red)

### Regional/National factors

In response to the issues identified in Section 1 of this report, questions were asked regarding supplier availability and capabilities, and broader policy matters regarding government taxes and policies.

Results from these questions relating to regional/national factors are summarised in Figure 10 (again, letter-symbols represent individual firm responses, with aggregate position signified by line-profile (red)).

The supplier base regionally/nationally scores negatively on all 3 measures tested, and these areas need improvement to remain competitive.

From a legislation and policy perspective, against the limited questions explored, the need to ensure legislation provides a level-playing field for UK based firms was seen as important and that environmental policies may negatively impact the region due to high-end vehicle sales being impacted most acutely.

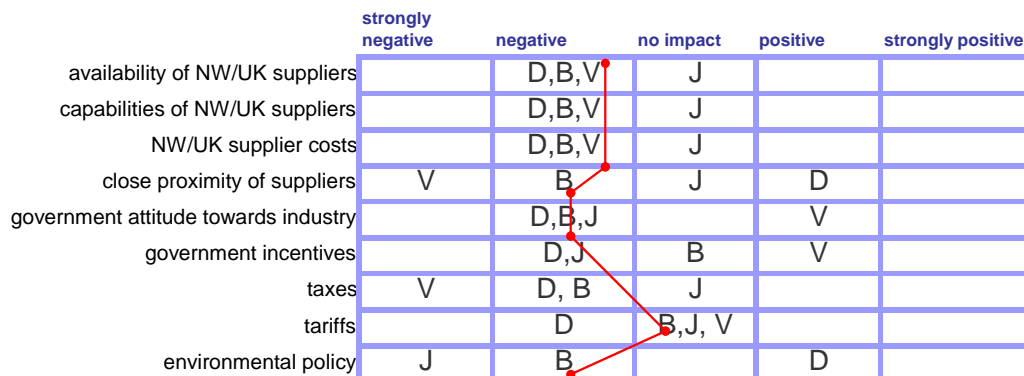


Figure 10 - Location factors impacting firms - Regional/National level (letter-symbols represent individual firm responses - aggregate position in red)

## Regional Strengths

Each of the major vehicle manufacturers were asked to comment on their views on regional sector strengths.

Their individual responses include the following representing views on current situation, and potential future strengths that could/should be targeted. In response to the question; **'What would you regard as the NW Automotive industry strengths?**

Now:

- D- Volume base and experience but aging workforce
- B- some regional cost advantage; Bentley unique skills in trim/leather
- J - Collaboration and understanding of the sector, networking
- V- local history, ability to exchange knowledge, can influence regional policy

Future

- D - Build on current capabilities & experience
- B - Universities; can we utilise?; Supplier Park development as a feed to VM's
- J - Strong supplier base, great innovation, BUT is the future now out of our hands
- V- logistics infrastructure, supplier costs and quality, skills - need continuous improvement to sustain presence

## 2.5 Barriers to growth

In terms of future growth potential, firms were asked to respond to key barriers to growth. In response to the question: **'What are your organisations main barriers to growth?** the following responses were captured;

- Suppliers with the right level of capacity
- Sales Infrastructure in the Emerging Markets and Market development
- Environmental legislation impacting premium car sales, Exchange rates, restrictive import duties in foreign markets (e.g. Russia)
- Cost structure, skill base, fuel taxes, environmental legislation, demand/factory capacity utilisation and its impact on costs

These responses reflect firm specific priorities - firms have not been identified for confidentiality reasons.

## 2.6 Environment

In response to the question - **'How does environmental legislation impact your business?** the following responses suggest these policy levers may be vital to future industry profitability and evolution.

- Environmental legislation e.g. emissions, end of life etc
  - Major impact will be emission standards,
  - Disability regs for public-use vehicles
  - End-of-life, .....batteries,
  - Congestion charging (e.g. Manchester) and
  - Need to use clean technologies;
  - Could be key to business evolution
- Sustainability initiatives
  - Alternative Materials
  - Implications on use of Steel, Aluminium, Biodegradable plastics

## 3. Supporting the Development of a Regional SC Strategy

### 3.1 Background

Support to the development of the Northwest Automotive Cluster Strategy involved;

- Providing inputs in the form of findings emerging from the prioritisation of regional issues (May 2008)
- Presentation of fieldwork interview analysis, and the strategic priorities that emerge thereof, to NAA members (November 2008), including commentary on emerging priorities
- Discussion with the NAA strategy development team on strategic themes as part of a strategy into action implementation planning activity (November/December 2008).

The first two strands of inputs have been summarised in Sections 1 and 2 of this report and the final stage of analysis, of finalisation of the strategic themes are summarised below.

### 3.2 Strategy Support - Review Process and Specific Inputs

#### NAA SC Strategy inputs

As part of the development of the NAA supply chain strategy, inputs were sought from the IfM to shape the activities of the group including effective deployment of the Advanced Manufacturing programme. The development of these elements involved a number of inputs from the IfM and workshop-style reviews.

#### Overall Process

The overall process has involved reviewing previous sector review studies, the identification and prioritisation of issues with industry, a (high-level) supply chain configuration and operations process-capability review with leading firms in the region, and active engagement with industry and NAA industry cluster association members throughout the project culminating in potential intervention strategy inputs.

#### Analysis and Review

The analysis has involved development, piloting and application of data collection instruments and questionnaires specific to the region and sector.

The outputs have undergone 'validation' workshops with key stakeholders, which have provided confidence on the findings and additional input to their contribution to strategy development.

Excellent participation has been observed with near full attendance at workshops that have involved all the major vehicle manufacturers and major tier1's in the region.

#### Specific inputs to Strategy Development and action planning

The supply chain analysis undertaken in this study, and summarised in Sections 1 and 2 of this report, have identified several key dimensions that might be considered in future strategy and action planning.

The current economic slowdown presents major challenges to several firms in the cluster and a co-ordinated regional and national response to mitigating these factors is called for - although not a focus of this study the retention of scale operations is vital to maintain regional competitiveness in many areas across the supply chain.

As part of the development of existing supply chains, a comprehensive **supply chain capability development programme** is called for that addresses the process deficiencies identified in Sections 1 and 2, including business process and operational-process weakness in supplier capabilities, the mixed picture in terms of execution of supply chain operational and lean management practices in most of the firms surveyed (e.g. Figures 6, 7), and development of operational skills development teams at factory floor level.

The absence of a regional innovation strategy coupled with the potential of several technology and business model discontinuities in the coming years calls for a focused response to the **development of future supply chains**. This element involving the development of potential future scenarios on evolving network structures is a strategic priority if the region is to compete long term. Potential discontinuities impacting future industry structure have been identified (e.g. Figure 5) and provide a basis for mapping emerging industry evolution paths.

In addition, the main observations for future strategy development considerations are as follows;

- Consider Value-chain 'footprint and supply-network configuration as complementary industry classifications
  - In addition to using the 'volume and SC tier-position
  - Value chain footprint - activities related to manufacturing and their criticality to business
  - Supply Network tier structure, inflows/outflows, value-chain linkages, product form
- Position in the supply chain and Value chain footprint
  - Different issues for VMs, T1s, T2s (see workshop findings)
  - Need to support key VC linkages as identified - considerable variation in VM footprints
- Volume Inflows/Outflows
  - Consider regional and national value-add to prioritise Co. specific and Regional funding
- Use of current competencies to promote regional leaders for JIS product capability?
  - Competences e.g. Trim - Bentley; Press Shop - Supplier Park development - Lean - JLR
- Proactive Policies to address gaps
  - Develop specialist training 'hubs': highly trained (c.20) to develop highly skilled engineer-technicians, supplier management skills, design engineering capability,
  - Address supplier footprint 'gaps' on a cross-company basis e.g. UK Plastic Moulding
  - Promote component/product lead roles in the region
  - Develop long term Energy Policy
  - Identify new technology lead companies to work with University partners (reversing the hollowing out of recent years) and as part of a Regional Innovation Strategy

### 3.3 Emerging Strategic Priorities

The review of the regional supply chain sector data, representing the evidence base, with NAA regional and firm representatives, has identified the following strategic priorities going forward, as a basis for determining potential supply chain intervention projects;

1. Supporting the regional sector through the current economic situation
2. Enhancing current supply chains through efficiency improvement projects
3. Developing future value chains to target high-growth potential segments
4. Projects specifically targeting environmental challenges

Key elements of each stream are explored below.

The strategic priorities below have been expanded to reflect potential action plans for implementation

1. **Supporting the regional sector through the current economic situation** (not a focus of this study)
  - o Developing an integrated regional and national response to supporting local industry in 09/10.
  
2. **Enhancing current supply chains through efficiency improvement projects**
  - o Expand SC Capability development programme to addressing weaknesses in supplier and VM capabilities identified in this report
  - o Plugging skill gaps, and activity gaps across VMs and the supplier-base
  - o Build economies of scale; cross-company opportunity analysis (VM focus)
    - i. Provide a forum for VMs to explore local sourcing gaps, and consider components/processes for potential Supplier Park development
    - ii. Developing international-scale tier 1's including potential partnering opportunities
  
3. **Developing future value chains to target high-growth potential segments**
  - o Exploit new/emerging technologies as part of a Regional/National Innovation strategy
  - o Support the development of joined-up national strategies shaping the market and industry
    - i. Environmental legislation development that supports niche sectors important to NW
    - ii. Industry development initiatives - innovation/technology, energy, infrastructure
  - o Develop University and other collaborations supporting High-Value Manufacturing
  - o Commission industry Value Chain mapping project
    - i. Future industrial scenario development building on identified industry discontinuities
    - ii. Plugging value chain gaps - across infrastructure, design, build, service
  
4. **Projects specifically targeting environmental challenges**
  - o Specific projects to improve efficient use of resources (link to strategic priority 2)
  - o Specific projects to address climate change challenges (link to strategic priority 3)

### 3.4 Further Development and Communication

The resources deployed in this work, in terms of study design and questionnaire development, supply chain analysis techniques, and separate power-point presentation draw on the research on supply chain configuration and capability models developed in the IfM. For further details contact Dr Jag Srai, Head of the Centre for International Manufacturing, Institute for Manufacturing, Department of Engineering, University of Cambridge. This project has been conducted through the IfM's Industry Links Unit.

This study has been one of several inputs to the development of the NAA Cluster Strategy 2009-19, for further information on the strategy, contact Neil Barlow, NAA.

## Appendix A – List of Emerging Sector Issues

Number	Priority/Issue	Focus
1	The future of key commodities (availability of current materials and new materials/processes) is not known	Yellow
2	There is little (institutional) support for key technology commodities (e.g. carbon fibre composites)	Yellow
3	The UK image of manufacturing is poor and has a negative impact on the availability of skilled persons	Red
4	Public sector initiatives are fragmented, bureaucratic and often duplicated	Red
5	There is a perceived lack of UK government response to competitive pressure and adverse local factors	Green
6	Company implementation strategy for environmental legislation is fragmented (driven by awareness and skills)	Yellow
7	It is difficult to take innovations (product and process) from concept to market	Yellow
8	There is a lack of technically capable and skilled graduates/technicians fit for industry purposes	Red
9	Top level analysis has identified major skill gaps; action plans are required to identify and meet future needs	Red
10	Business strategy and processes need improving at tier 1 and 2 levels in the sector	Green
11	Core competencies of the Northwest need capturing, documenting and promoting	Green
12	There is a lack of lean implementation in tier 1 and 2 suppliers	Green
13	There is no definitive Northwest supplier database	Red
14	There is a perceived lack of collaboration between universities and automotive companies in the Northwest	Green
15	The flows in and out of the region between OEMs, 1 <sup>st</sup> tiers and 2 <sup>nd</sup> tiers are not clearly mapped	Green
16	The potential linkages in the value chain need capturing; there may be potential for Just In Sequence component manufacture and supply	Green
17	There are unrealised sector aggregation and outsourcing opportunities e.g. NW supply hub and specialist chemicals management	Green
18	The reasons for UK supplier growth/decline are not fully known (quality, cost, delivery): what are the key success factors for future business?	Green
19	There are unrealised service (supply chain) opportunities	Green
20	Regional logistic capabilities and infrastructure appear to be poor	Green

The following classification of the nature of the issues was used:

- The issues are clear and action plans should follow immediately (**RED**)
- A broader value chain analysis would be of benefit (**AMBER**)
- Further supply network analysis is required (**GREEN**)



Appendix B – 12<sup>th</sup> May 2008 Workshop Participants

Name	Company
Peter Nixon	Bentley Motors
David Maughan	Bentley Motors (Representing NAA Board)
Andrew McCrae	Bosal UK
Jenny Clucas	Chemicals Northwest
Alan Pinkney	CHK Engineering PLC
Mark Houlton	Darwen Group
Bill Bissett	Futaba Tenneco Ltd.
Kevin Schofield	Futaba Tenneco Ltd.
Bob Taylor	Getrag Ford Transmissions
Claire Davies	Institute for Manufacturing, Cambridge University
Jag Srai	Institute for Manufacturing, Cambridge University
Alan Walker	Jaguar Land Rover (Halewood)
Paul Myerscough	James Walker & Co Ltd
Peter Middleton	MITRAS Automotive (UK) Ltd
Alan Manning	Northwest Automotive Alliance
Neil Barlow	Northwest Automotive Alliance
Peter Holland	Northwest Development Agency
Sami Falou	Northwest Development Agency
Tony Digravio	Pirelli Tyres
Laurence Tabner	Sanko Gosei Ltd
Colin Harwood	Syncreon Automotive
Paul Croxford	Vauxhall Motors