

Automotive Australia 2020

CAPABILITIES



Introduction

This report presents the outcomes of the third phase of the Automotive Australia 2020 project (AA2020). Phase 3 has resulted in the identification and prioritisation of Technology Needs in the short and long term. These technology needs are a key component of a roadmap for the Australian automotive industry to 2020 and beyond. The roadmap provides a mechanism for the industry to articulate a vision and strategy to remain competitive in the short, medium and long term.

Phase 1, Establishing a Vision, was completed with the release of the *Automotive Australia 2020 Vision* report on the 28th of September 2009. Development of this Vision was achieved through extensive research and interaction with industry, which culminated in a one day Vision Workshop.

Phase 2 and Phase 3 of the project have been run in parallel and involved the definition of technology needs and the identification of the industry capabilities. The identified needs can be found in the accompanying report: *Automotive Australia 2020 – Technology Needs*.

This report, *Automotive Australia 2020 – Capabilities*, presents the findings from interviews and surveys conducted across the automotive industry as well as the non-automotive and research and development sectors. These findings were further verified through industry participation in workshops held on the 23rd and 24th of November. As a result, the fit between opportunities and short and long term capability have been identified.

PHASE 1 Establishing a vision

PHASE 2 Defining immediate domestic and long-term future global market need

PHASE 3 Understanding national capability

PHASE 4 Identifying key tactical and strategic opportunities

PHASE 5 Strategic opportunity roadmap development

PHASE 6 Prioritisation

For the purposes of the AA2020 project, short term capability is defined as current capability in the Australian automotive industry and supply base, while long term capability includes developing capability within the automotive sector, capability applicable but external to the automotive sector and research capability with relevance to the automotive industry.

The results presented here have been used in Phase 4, which identifies the relative strength of identified opportunities by analysing the fit with industry capabilities and the market attractiveness. The strongest opportunities are those where there is significant market attractiveness with a close match to Australian capability.

In Phase 5, strategic opportunity roadmaps will be developed to further investigate the strongest of the long term opportunities, to provide a detailed understanding of the specific opportunity, including enabling actions to realise the opportunity. These strategic opportunity roadmaps will be prioritised during Phase 6 and become the final representation of the Automotive Australia 2020 roadmap, providing an articulated strategic direction for the Australian automotive industry.

Research Methodology

Capability Mapping Approach

Relevant Australian capability has been identified through an investigation of industrial capability in the automotive sector and in the broader manufacturing, process, energy and ICT sectors, together with the national science and research base. Data has been gathered through interviews and surveys tailored to each stakeholder group. These stakeholders were initially targeted based on priority areas identified in Phase 1 and have been informed on an iterative basis by the developing understanding of market need.

Motor Vehicle Producers (MVPs)

All three Australian MVPs have completed extensive questionnaires, focused on more than one hundred opportunities in the short and long term. These questionnaires focused on technology need and opportunity attractiveness, however a number of important aspects relating to capability have also been captured, including:

- ▶ Likely future sourcing preference and rationale for this (including commentary on local capability),
- ▶ Weighting of Critical Success Factors (CSFs) relevant to priority opportunities (Cost, Quality, Delivery, Innovation, Service and Responsiveness),
- ▶ Identification of world-class suppliers for each opportunity and benchmarking of Australian supplier performance against these, and
- ▶ Identification of relevant strengths in the Australian national capability.

The questionnaires have been supported by interviews and workshops as appropriate to explore specific capabilities of interest.

Automotive Suppliers

There were 41 automotive suppliers selected for their specific relevance to the key opportunity areas and each completed a site visit and interview with an experienced industry professional. Focus areas of the interview included:

- ▶ Identification of relevant capabilities and assessment of competitive performance against the CSFs (both self-assessed and moderated by the interviewer). This was underpinned by evidence where appropriate,
- ▶ Understanding of areas of investment (in terms of capacity, production technology, product innovation and intellectual property),
- ▶ Review of operational and innovation processes and benchmarks, and
- ▶ Identification of trading and technology relationships within Australia and globally.

In addition to these selected suppliers an open survey was made available via the AA2020 website and circulated through trade bodies with the aim of capturing the wider supplier community.

Non-automotive Suppliers

A shortlist of 10 suppliers with relevant capabilities spanning a number of priority opportunities were selected for interview, covering aerospace, defence, ICT and other industries. Similar to the automotive sector interviews, these focused on identification of potential matches between supplier capabilities and priority opportunities. These interviews were backed by an open survey made available via the AA2020 website and through trade bodies with the aim of capturing the wider supplier community.

The limited number of interviews served to illustrate the wealth of relevant capability waiting to be tapped outside of the existing automotive supply sector. An important aspect of Phase 5 of the AA2020 programme will be to draw in relevant expertise from outside the industry to explore the most promising future technology opportunities.

Science and Research Base

There were 95 research organisations and university departments invited to have researchers complete an online questionnaire. Subsequently, 11 centres of science and technology research were interviewed. The science and research interviews focused on:

- ▶ Identification of relevant research programmes and technology capabilities matching priority long term opportunities,
- ▶ Assessment of strengths in terms of technology readiness levels, depth of research teams and relevant research publications, and
- ▶ Track record of technology exploitation and protection.

Other Australian Resources

Research of published strategy and roadmap documents from Phase 1 of the AA2020 project has been used to identify other relevant Australian resources, including natural and human resources, policy and infrastructural assets.

Data Analysis and Validation

The data capture process identified over 2,000 distinct matches between capabilities and opportunities from across the various sources. With many capabilities being relevant to a number of opportunities, the aggregate of the relevant capabilities was used to form an overall assessment of *capability fit*. The overall fit with capability for each priority opportunity is evaluated against the five short and long term criteria defined in Phase 1 by the Vision Workshop.

The resulting capability scores were combined with an assessment of opportunity attractiveness, as described in the accompanying report *Automotive Australia 2020 – Technology Needs*, to identify a shortlist of approximately 60 opportunities in both the short and long term. These formed the input to short and long term workshops, with more than 80 industry experts participating. Working in groups relating to a specific subsystem, these experts reviewed and moderated the capability by a process of prioritisation, with each group of opportunities assessed against each evaluation criterion. The updated scores are presented in the following sections.

Mapping Short Term Capability

Capability, in the short term, has been used broadly to represent the ability of existing parts suppliers and service providers to realise identified opportunities in the next model cycle. Evaluation of current capability as it relates to short term opportunities required the development of evaluation criteria, and these were defined in the first phase of the AA2020 project. For each of the five criteria identified, a number of metrics were developed to allow calculation of quantitative assessments of fit with capability for each opportunity.

These criteria address a range of different metrics to assess the level of capability. These metrics include benchmarks against international best practice, the long term competitiveness of the capability, the

importance within Australian supply chain and level of international collaboration. An overall score has been calculated as the weighted average of the evaluation criteria.

SC1	45%
Supply base competitiveness to meet critical success factors (CSFs) <ul style="list-style-type: none"> ▶ Importance of CSFs ▶ Benchmark ratings for suppliers ▶ Alignment between importance and performance 	
SC2	20%
Potential for long term, sustainable competitive position <ul style="list-style-type: none"> ▶ Innovation and investment activities in the supply base ▶ Capabilities that are likely to survive and thrive in the medium term 	
SC3	15%
Supply base capability to supply (including capacity, financial and management capabilities). <ul style="list-style-type: none"> ▶ Proportion of market met by Australian capacity ▶ Financial capability and resources ▶ Best practice processes and strategic management 	
SC4	10%
Critical mass and importance of Australian supply chain <ul style="list-style-type: none"> ▶ Importance of supply chain (desired CSFs for delivery, service and responsiveness) ▶ Depth of capability (dispersed or concentrated) ▶ Degree of local autonomy 	
SC5	10%
Partnerships with emerging Asian economies for technology and trade <ul style="list-style-type: none"> ▶ Export activities in these countries ▶ Effective sourcing and supply base in these countries ▶ Technology collaboration in these countries ▶ Subsidiaries or sister companies in these countries 	

TABLE 1 – FIT WITH CAPABILITY EVALUATION CRITERIA FOR SHORT TERM OPPORTUNITIES. CRITERIA HAVE BEEN ORGANISED IN DESCENDING ORDER BY ASSIGNED WEIGHTING.

Short Term Capability

	Opportunity	Fit With Capability					Overall Score				
		SC1	SC2	SC3	SC4	SC5	1	2	3	4	5
Body (Other)	Hood Strut	4.3	4.5	4.6	2.0	3.4					
	Pressings	4.5	4.2	4.2	4.0	1.5					
	Exterior Mirrors	4.0	3.0	4.6	3.8	2.9					
	Air Conditioner	3.8	3.5	3.0	3.6	2.4					
	Bumper Absorber	3.3	4.0	4.6	1.0	2.0					
	Airbags	3.5	2.8	4.6	2.0	2.3					
	Seatbelts	3.5	3.0	3.7	1.9	3.0					
	Glass	1.5	1.0	2.0	3.5	2.5					
Body (Trim)	Seat Set	4.2	4.4	4.7	4.5	4.0					
	Instrument Panel	4.4	4.5	4.3	4.3	2.2					
	Steering Wheel	3.5	3.9	4.0	3.5	2.4					
	Consoles	3.2	4.1	3.4	3.8	2.5					
	Door Trim	3.8	3.5	2.4	3.3	2.8					
	Injection Moulded Components	3.0	3.5	3.2	3.8	3.5					
	Carpet	2.7	3.0	2.0	3.0	2.8					
	Insulators	2.6	2.0	2.5	2.8	3.8					
Chassis (Other)	Rotors	4.2	3.8	5.0	3.0	3.4					
	Power Steering Link	3.7	3.2	4.7	3.6	4.6					
	Steering Column	3.7	3.2	4.7	3.6	4.6					
	Exhaust Systems	3.7	3.2	4.2	4.0	3.0					
	Tube Assemblies	3.7	3.0	4.1	1.0	2.8					
	Master Cylinder	3.3	2.0	3.2	2.8	3.4					
Chassis (Running Gear)	Calipers	0.0	3.8	5.0	3.0	3.4					
	Suspension Springs	3.5	3.0	4.5	3.5	4.0					
	Suspension Bushes	4.2	2.5	4.5	2.5	2.6					
	Hub & Bearing Assembly	4.3	1.0	4.5	1.3	1.0					
	Alloy Wheel	3.5	1.5	2.8	3.0	3.5					
	Steel Wheels	2.5	1.3	1.0	3.0	2.0					
Driveline (Engine)	Tyres	2.4	1.0	1.0	2.0	3.4					
	Radiator	4.9	3.0	4.0	3.5	3.0					
	Plastic Intake Manifold	3.7	4.1	3.0	3.0	3.0					
	Aluminium Cylinder Head	3.6	4.0	2.5	4.0	2.5					
	Cylinder Block	3.0	4.7	2.5	4.0	2.5					
	Oilpan	3.6	3.0	3.8	3.0	1.0					
Driveline (Other)	Pistons	1.0	1.0	1.0	1.0	1.0					
	Auto-Shifter	3.4	4.1	4.7	2.0	1.4					
	Fuel Tanks	4.1	3.7	2.1	2.2	1.4					
	Tube assemblies	4.2	3.2	2.2	1.7	1.4					
	Shafts	3.3	3.2	3.0	2.6	2.5					
	Half Shafts	3.3	3.0	2.9	2.9	2.5					
Electrical & Control	Transmission	3.0	2.5	2.0	3.3	3.0					
	Fuel Pump	2.7	2.8	1.8	1.3	1.4					
	Battery	3.9	4.1	5.0	4.0	2.3					
	Combi Meter & Clock	3.8	4.1	5.0	3.1	3.5					
	ABS/ESC	3.0	3.5	5.0	2.1	3.2					
	Audio System	3.7	3.8	2.0	3.1	2.4					
Engineering Services	Lampware (Head & Tail)	3.5	2.8	4.1	2.4	2.6					
	Wiring Harness	4.4	2.8	1.3	1.6	1.6					
	Navigation system	3.5	3.8	1.3	3.0	2.2					
	Interior Lighting	1.0	4.1	3.1	2.6	2.5					
	Styling, Industrial Design	4.0	5.0	5.0	4.4	3.5					
	IC Engine & Driveline Technology	4.0	4.0	4.0	3.5	4.5					
Manufacturing & Other	Dynamic & Aerodynamic Technology	4.0	4.9	3.5	3.5	3.3					
	Simulation & Modelling	4.0	3.0	4.0	2.9	2.9					
	Testing & Approvals	3.0	3.0	3.5	3.4	3.3					
	Testing Equipment	3.0	3.5	3.0	3.0	2.5					
	Rapid Prototyping	3.0	3.0	3.0	3.6	2.0					
	Aluminium	4.3	3.9	4.7	1.3	4.0					
Manufacturing & Other	Side Impact Beams	4.2	2.5	4.7	2.2	5.0					
	Painting Process	4.0	3.4	4.7	4.4	1.5					
	Steel (Raw Material)	3.5	4.0	4.0	3.8	4.0					
	Tooling	3.0	4.7	2.5	5.0	4.0					
	Fabrics & Leather	4.3	1.9	2.9	4.4	3.4					
	E-coating	3.2	3.8	2.9	3.8	2.4					

FIGURE 1 – FIT WITH CAPABILITIES AS MEASURED FOR EACH SHORT TERM OPPORTUNITY BY AUTOMOTIVE SUBSYSTEM

The top short term opportunities and their scores across each of the selection criteria have been presented above in Figure 1. Scores in each column have been normalised over a range of 1 to 5, where 1 represents the lowest assessment against the criteria with 5 being the highest.

This allows an overall, weighted average to be calculated, representing the opportunity's fit with Australian capability. Opportunities have been organised by automotive subsystem, allowing identification of capability strengths across the automotive subsystems sectors.

Mapping Long Term Capability

Long term capability identifies synergies between identified opportunities and current activity in the industrial and research sectors. Additional synergies have been identified with natural and human resources, and in allied non-automotive sectors. Quantitative assessments of Australian long term capability have been made according to six selection criteria identified in the first phase of the AA2020 project. Each of these criteria has been evaluated against a number of underpinning metrics.

The majority of the long term criteria aim to establish a fit between existing capability and capabilities that will be required to realise future opportunities. The remaining criteria aim to identify the potential to develop capability from outside the automotive supply base. This can be

achieved through either transfer of technology from the science base or the integration of non-automotive capability into the automotive sector. Each criterion has been assigned a weighting and these have been used to calculate an overall capability score.



TABLE 2 – FIT WITH CAPABILITY EVALUATION CRITERIA FOR LONG TERM OPPORTUNITIES. CRITERIA HAVE BEEN ORGANISED IN DESCENDING ORDER BY ASSIGNED WEIGHTING.

Long Term Capability



FIGURE 2 – FIT WITH CAPABILITY AS MEASURED FOR EACH LONG TERM OPPORTUNITY BY AUTOMOTIVE SUBSYSTEM

Scores for each evaluation criterion were established as described in the Research Methodology section and these are presented in Figure 2 above. These scores have been normalised to provide a measure of relative strength across each of the criteria, and to allow the calculation of a weighted average (according to the assigned weightings in Table 2). Again a score of 1 represents a low assessment against the criteria, while a score of 5 represent a high assessment.

Not every opportunity fits neatly into one particular category, and these have been assigned to facilitate reporting and data representation. Sensors, for example, have been captured in control although they can be found throughout the car. Equally, supercapacitors have been categorise as electrical, but are also a potential energy storage solution for non-IC drivelines. Each opportunity has been treated independently during data capture and analysis.

Industrial Sector Capability

In addition to measuring capability for individual opportunities, the data gathered has been used to map capability across industry sectors. Measured scores for opportunities in a particular sector have been averaged across the evaluation criteria to provide an indication of industry capability and performance at the sector level. Sector scores against each of the short and long term evaluation criteria are presented in the following subsections.

Body and Chassis Sectors

Scores measured for body and chassis sectors are shown below in Figure 3. In the short term (at left) it is evident that capability is above average. In the long term strengths in innovation and core engineering remain high. However, there is more limited alignment between current

processes and technologies, and those that might be needed to realise future opportunities. Correlation between these labour intensive sectors and the low volume, high value-add processes in non-automotive industries is particularly low.

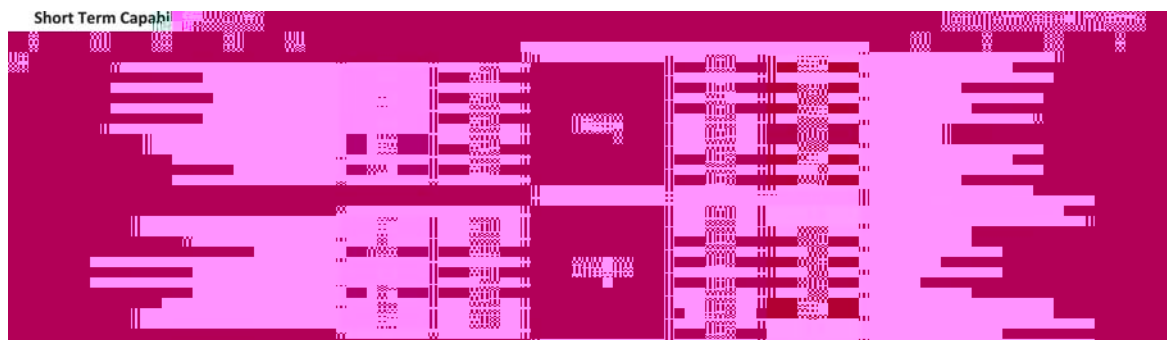


FIGURE 3 – SHORT AND LONG TERM CAPABILITY SCORES FOR BODY AND CHASSIS SECTORS

Driveline Sector

A sector of particular interest is driveline (shown in Figure 4). This sector is beginning a transformation from traditional internal combustion (IC) engines, through hybrid technology, to alternative non-IC systems. In IC driveline technology, there is current supply base capability, but a diminishing trend is shown by the critical mass (SC4), performance benchmarking (SC1) and international partnership criteria (SC5).

The long term scores reflect this diminishing capability with a high score in LC5 indicating a possible correlation between developments in gaseous fuel drivelines.

There is very little current capability in non-IC driveline systems, but the fit with Australian capability is expected to increase substantially in the long term. Current automotive, non-automotive and research capabilities are well aligned to those that will be required for non-IC technology and there is significant innovation capacity in these areas.

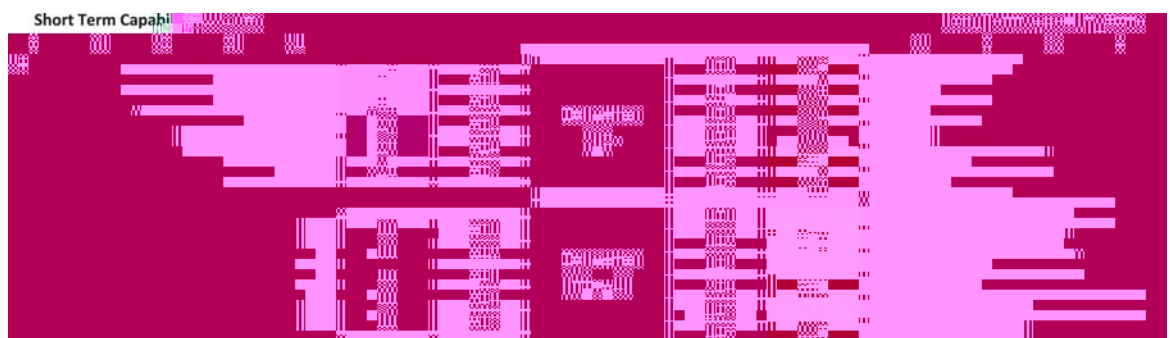


FIGURE 4 – SHORT AND LONG TERM CAPABILITY SCORES FOR DRIVELINE (IC AND NON-IC) SECTORS

Electrical and Control Sectors

In a similar manner to IC driveline technology, below average scores in critical mass (SC4) and international partnership criteria (SC5) indicate diminishing Australian capability in the electrical sector (Figure 5). This likely reflects the mature nature of these technologies and a consequent shift to low cost mass production in low

cost countries. This shift toward knowledge-based technologies is further evidenced by comparative strength in the control sector where software and advanced sensors are leading many new technology developments in the automotive industry.

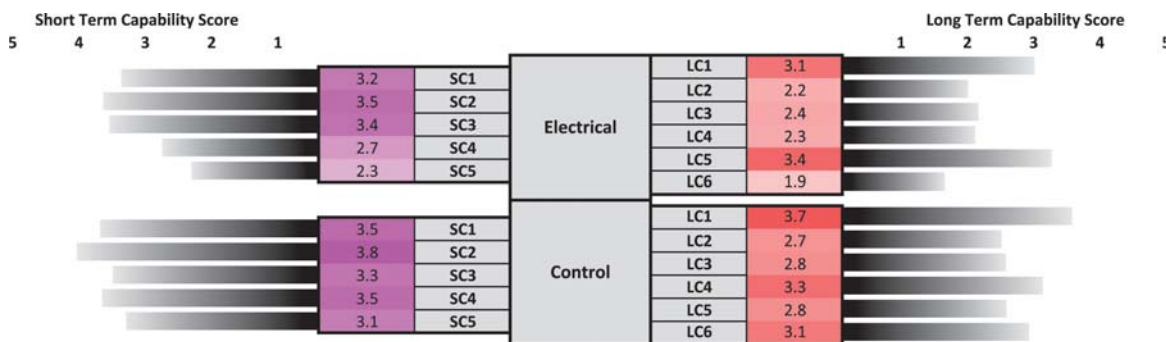


FIGURE 5 – SHORT AND LONG TERM CAPABILITY SCORES FOR ELECTRICAL AND CONTROL SECTORS

Engineering Services and Manufacturing Sectors

Capability in the engineering services and manufacturing sectors are shown to be particularly strong in Figure 6. Both of these sectors are particularly valuable long term because their broad nature allows wide applicability regardless of the future course of technology in the automotive industry. Core engineering services scores

show uncertainty about direct correlation between current capability and future opportunities. However, scores are much higher in criteria relating to innovative capacity (LC1), fit with other resources (LC5), and international partnerships (LC6). This indicates an adaptable sector, able to support a range of possible future opportunities

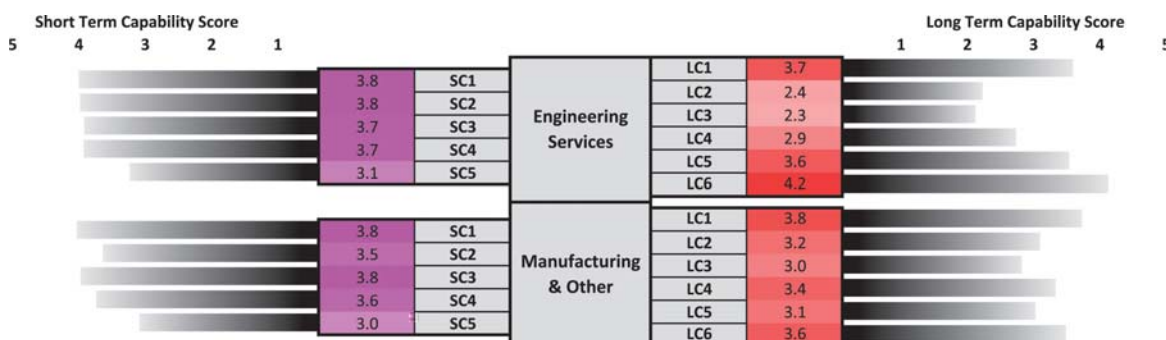


FIGURE 6 – SHORT AND LONG TERM CAPABILITY SCORES FOR ENGINEERING SERVICES AND MANUFACTURING SECTORS

Science and Research Capability

The automotive sector is one of the largest investors in Research and Development in Australia.¹ While the Australian economic success has traditionally been focussed around agriculture and natural resources and these sectors remain important, the economy is currently transitioning to become increasingly knowledge-based.

Coinciding with this transformation has been an increase in funding for research and development. Among OECD nations, Australia ranks 14th in business expenditure on research and development (BERD), while large investment from government and higher education sectors raise Australia into the top 10 when measuring gross research and development expenditure (GERD).²

Because research capability will be critical if Australia is to capture long term opportunities in the automotive industry, one important selection criterion measures the fit between these opportunities and current research programs. Figure 7 shows this criterion for the top 25 long term opportunities, which have been arranged in descending order of fit.

There is significant correlation between the fit with research capability presented here, and the fit with overall capability presented in Figure 2, with many of Australia's overall strengths being mirrored in the science base.

Correlation among the opportunities is also evident, with many relating to lightweighting through materials and design with another cluster evident in communications and sensing.

Australia's large investment into research and development, and its breadth of skills, highlights that a strong potential exists within the Australian market to develop meaningful strategies around these opportunities.

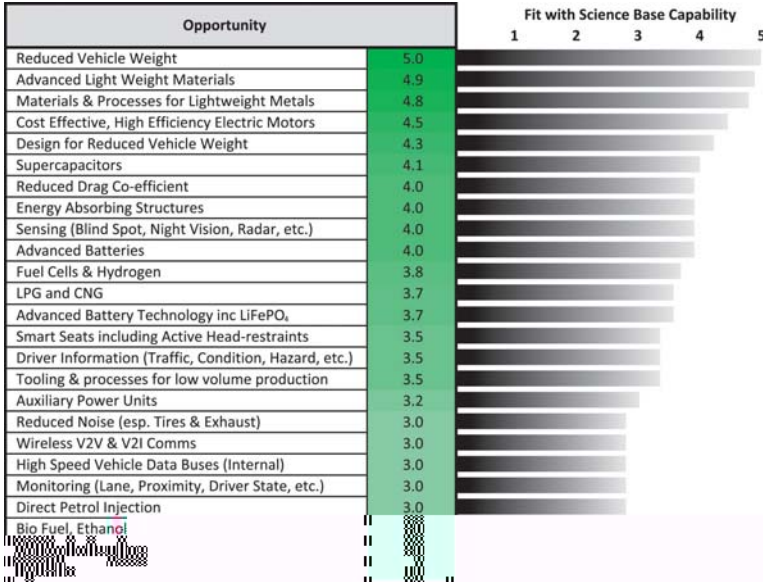


FIGURE 7 - FIT WITH AUSTRALIAN RESEARCH CAPABILITY FOR THE TOP 25 IDENTIFIED LONG TERM OPPORTUNITIES

1 Commonwealth of Australia. Review of Australia's Automotive Industry. July, 2008
 2 OECD. Main Science and Technology Indicators. (2009/1)
 3 United Nations. Commodity Trade Statistics Database. (2006)
 4 Australian Department of Foreign Affairs and Trade. A stable and competitive economy. Retrieved from: http://www.dfat.gov.au/aib/competitive_economy.html

Other Australian Resources

Alignment with human and natural resources has been measured through a specific evaluation criterion (LC5) and represents an important component of the overall capability score. This reflects the role of abundant natural resources in establishing the global relevance of the Australian economy.

This considerable natural advantage allows Australia to be a dominant force and among the world’s largest exporters in a number of categories, including:³

- ▶ Metallic ores (including zinc, tin, and iron)
- ▶ Fuels (including coal and natural gas)

Resources, as a strong element of the Australian economy, will provide significant competitive advantage to closely aligned opportunities. This alignment was evaluated and the top 25 opportunities are shown in Figure 8.

The preceding section addressed the strength of the Australian knowledge economy, and this is enhanced by proximity to emerging Asian economies – the fastest growing region in the world. In this region, Australia ranks first in labour productivity in industrial sectors with increasing focus on advanced manufacturing with high value add.⁴

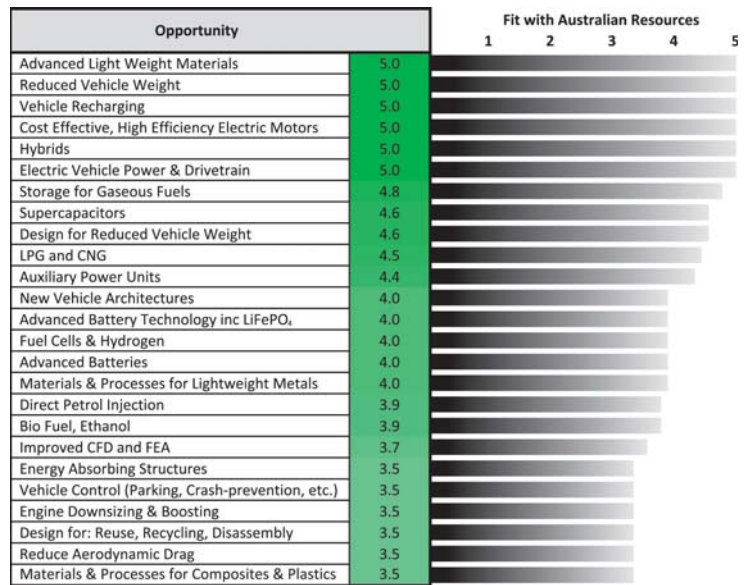


FIGURE 8 – FIT WITH OTHER AUSTRALIAN RESOURCES FOR THE TOP 25 IDENTIFIED LONG TERM OPPORTUNITIES

Conclusion

This third phase of the Automotive Australia 2020 project has identified fit between opportunities and both the existing capabilities within the Australian automotive sector and the developing capabilities relevant to the long term needs of the automotive industry.

Capabilities have been identified in 8 broad categories: Body, Chassis, Driveline IC, Driveline Non-IC, Electrical, Control, Engineering Services and Manufacturing Processes. This research has shown significant current capability in many sectors of the automotive industry. It has highlighted the shift in capability from current driveline technology to growing capability of non internal combustion driveline technology. These capabilities align well with the development in the technology needs identified in Phase 2.

Long term capabilities have been identified as developing from the science base, non-automotive sector and automotive sector through current research and investment in technology, and alignment with current underlying capability. This development shows a movement from traditional labour intensive manufacturing toward high value and knowledge based capabilities.

Linking these identified capabilities with the market and technology needs during Phase 4 will identify the most attractive opportunities for the Australian automotive industry moving forward to 2020 and beyond.

Long term priority opportunities identified in Phase 4 will be carried through to the final stages of the project. Phases 5 and 6 will seek detailed input from key experts and stakeholders to develop individual roadmaps for each opportunity, identifying strategic strengths, and key gaps. Potential enabling actions on the part of government and industry, which address gaps and allow opportunities to be realised, will also be captured.

