UK Marine Industries Roadmap & Capability Study

Workshop C: Marine Leisure & Equipment, 9 November







Executive Summary

This report results from a one-day workshop to assist the Technology Strategy Board, BIS, UK Marine Industries Alliance and the Transport KTN to develop a roadmap to identify future priority opportunities and capability needs for the UK Marine Industries. The workshop was the third of five "Deep Dive" explorations of the sector, focussing on Marine Leisure & Equipment. The workshop took place at the University of Warwick on 9 November 2011, with input from over 20 experts drawn from across the Marine Industry, academia and other stakeholders. The workshop took a sub-set of the landscape roadmap, developed in June 2011, which was then developed further to identify priority trends & drivers and then to identify and characterise around 40 Market Opportunities in Marine Leisure and Equipment.

Participants contributed before the workshop by providing their perspectives in a roadmap template – identifying priority Drivers, Opportunities, Capabilities and Enablers in the Short, Medium and Long timeframes. These were consolidated ahead of the workshop to provide a start point to which further issues were added and priorities identified. The most important market opportunities were then highlighted, where UK capability could deliver against major global market needs. These assessments were based on defined criteria for Value (global & UK market, competitive strength, added value and impact on societal and environmental challenges) and Capability (in the marine industry, academia, research organisations and from adjacent industries – see Appendix C for details.)

In prioritising relevant Trends & Drivers (see section 1), there was a strong emphasis on changing demographics and consumer demand (from the needs of an ageing population, challenges of introducing new people to boating and opportunities from emerging Markets / BRIC Growth) resulting in a more "clean hands - no sweat" boat operation; as well as the challenges of reversing the increasing cost of boating at a time of economic downturn. The role of standards will be significant, especially from EU and relating to technical, environmental (NOX, SOX, particulates, waste & CO2) and safety; as will new technologies including more environmentally-friendly propulsion energy solutions; simulation & modelling and Accelerated NPD processes. Through-life support will be vital in delivering lower cost of ownership, with the need to consider recycling, retrofit and upgrade, as well as end of life disposal & recycling.





Executive Summary (continued)

Priority Opportunities (see section 3) were identified across a range of areas, though largely focussed on marine leisure rather than equipment. The leading opportunities included: Easy to use leisure navigation system & integrated communications / data; Alternative fuels / Electrification & Hybrids & efficient propulsion / re-powering ;New leisure marine products for developing markets (and tailoring for specific market needs); Volume produced smaller leisure craft types for affordable participation eg for first-time owners / 3rd age; Lower-cost construction methods and Hull design, vessel design & aesthetics . Opportunities for equipment and component technologies were highlighted, including sustainable composites & smart materials; Coatings (eg for low friction); Safety systems & equipment ; Technologies for (Semi-)autonomous control & navigation (eg Intuitive IT based controls) and Exhaust after treatment systems however these were not highly prioritised as the necessary expertise were under-represented in the workshop participants.

Of these opportunities, the first six were explored in more detail – to characterise the market value and identify relevant sources of UK capability for delivery (and potential gaps that will need to be filled – see section 7)

In support of these opportunities, a wide range of capabilities were identified from within the Marine Industries but also in academia and research organisations. The most relevant areas of capability to support these market opportunities were: Supply Chain management; Service & Support; Simulation & modelling; CAE / CAD / CAM; Design processes & Modularisation; Materials technology; Manufacturing technology; Design & manufacture for sustainability.

The workshop also identified other key enablers for success, underpinning these capabilities as: Understanding Customer / Owner / Operator needs; Technology transfer from other industries; Skills availability; Training & Education; Funding & investment; Partnerships & Networks; International collaboration; Supply chain / logistics; Business Model Innovation and Technology translators.

It was particularly notable that the role of technology transfer from other areas of Marine and the wider industrial base (and supporting enablers to deliver this) was strongly prevalent in the delivery of all the priority opportunities.





1. Roadmap Landscape

		Past	2011	Short term	2013	2013	Medium term	2015	2015	Long term	2020	Horizon to 2050
vers	Social		Ethical / Green co Public opinion	Safety Cargo	(People, Ships &	Changing den / ageing popul Eas	nographics / consumer de lation e of use / "plug & play" /	Urb. Cor	anisation & ngestion			
	Technological	Accelerated	NPD process	3D CAD/CAM/CAE / s & modelling / rapid to	simulation oling	Clea	an hands - No sweat	Positionin	g & Communications gies	> New p solution	propulsion energy ons	itonomous stems
ls & Dri	Environmental	Marine ecosystem management& res	icient use of ources	te change ation (Low Carbon)	Tech Migration of freight f waterways & coasta	nology Insertion from road to inland	Energy & Fuel scarcity demand for reduced c	/cost => onsumption	Sea level rise, acidification, ncreasing temp & extreme v	veather	End of Life disposal & recycling	Green shipping
Trend	Economic	Pressure on Procurement & through life costs	Con pnomic Downtum (incl nding availability	st of boating reasing EU tech safety s	nnical, environmental a standards / legislation	"Green Ec as a busin	onomy": en vironment ess opportunity	merging Markets / BRIC Growth	Through life supp Servitisation	ort &		
	Political & Legal	Globa infrast	l maritime surveillance ructure		O regulations for ntrol of CO2 emissions	>	Import tariffs & protectionism	NOX, SOX and Particulates regula	Compulsory certification for	boat	100% recycling of onboard waste	Changing nature of military threat
	New leisure marine products			New leis develop	sure marine products fo bing markets	Market-I product	ailored Vi s for export af	olume produced sma fordable participation	Iller leisure craft types for n eg for first-time owners	>	New bo facilities	bating concepts and user s (incl cross-sector products)
S	Useability & Maintainability		Vessel de aesthetic	clea Swe	an Hands / No eat	Reduced cost o Owners (eg low	of ownership for Leisure of thru-life cost craft)	3rd Age Lo products	eisure Automa mainte	ated nance	Through-life services & automotion	}
t Need	Navigation & control equipment		Comms 8 with easy	Data integration	Easy to use (Sea TomTo	leisure navigation sys m)	Entertainment int with leisure vesse	legration Im	proved diagnostics &	Techn naviga	nologies for (Semi-)autono ation (eg Intuitive IT based	mous control & controls)
larke	Waste management / treatment & Ballast water systems			Waste mana treatment &	gement / Ballast water							
s & N	Refurbishment / Repair / Refit & end-of-	Repair of Leisure craft	Standard & modular	interfaces ity		Up re	ogradable & configurable boats		Refit / Re-purposing of Leisure craft	>		Recycling & end-of- life
nitie	"Green shipping" technology for reduced	Cool to be Green Coat friction	ings (eg for low	Exhaust after treatment system	s Efficier	nt propulsion (inc re- ng of existing boats)	\rightarrow	Hull design	Vessel-level e monitoring	nergy	Alternative fuels / Elec & energy harvesting (e	ctrification & Hybrids
portu	Safety, Comfort & crash-worthiness		Enha	inced passenger	Safe	er propulsion	Crashworth vessels	,	Safety system equipment	ns &		<u> </u>
õ	Other Theme C	Lower-c construct	ost ction	Sustainable composite & smart materials	Low electrica equioment	alpower	Achieving higher utilisation	More charter "staycation"	fleets			
	Other Themes			New user experience / training	>	Tum-key rental / share access to I	time- eisure	New Marina Infrastructur	s & re			
	Design & Development	Simulation & Too modelling Tec	ls & hniques	Human factors	CAE/CAD/CAM	Design proc & Modularis	Naval an	chitecture M	Marinisation	Development testing A validation	g Analysis tools	>
S	Construction, Structural & Mechanical		Med syst	chanical tems	Offs	hore wind		Sub-sea technology	Tidal & wave power			
abilitie	Materials & Manufacturing	Materials technology	atings hnology	Manufacturing technology	Processing techn (eg Wastewater)	ology	Joining teo (eg Welding	chnologies	Lightweighting	ow volume manufa rapid prototyping	acturing	
& Cap	Propulsion, Energy & Power	Internal combustion engine technology			Electrical systems storage & power	Power system management	ems ent Propuls technol	ion ogy Me end	echanical ergy & storage	ric drive hology		
logies	Information, Communication & Control	Sensors, measurement and monitoring	ntrol, tomation &	Data management	Navigation technology	Logistics/	traffic ent Voyage manag	e ement	Decision support systems	Communications (LAN / Wireless)	Telecoms (wide- area)	,
echno	Life-cycle technologies	Service & Support	aintenance	Life-cycle analysis	End of life / recyc / Decommissioni	ng Technolo & reconfig	gy insertion gurability Condit Monito	ring	Supply Chain management	In-service testing	Design & manut for sustainability	facture
F	Safety & security	Offensive & Nati	onal security	Personal safety	Active safety	> Safety testing						
	Other		[Risk managament & acturarial	Biotech	& biological Marin ng Scien	ices	Systems integration / engineering	[Integrated Transport	ceanography / Environment g currents & ice caps)
	Funding & Resources			Focussed	Research Funding	g&			Incentives to industry to			
	Marketing & Brand		Understanding (Owner / Operato	Customer/		Major to esta	pathfinder projects	Business Model				Marine technology revolution
sis	People & Skills	Skills availability		Profess	ional Training				Technology			
able	Facilities & Infrastructure		Facilities, infrastructure &	>				Oceanogr	aphic centres			
Ĕ	Partnerships & Supply Chain			Supply chain /			Partnerships & Networks			ternational	>	
	Standards & Regulation	Safety legislation	Standards		IP security &	Open	>	Environmental				
	Other			from other industries		unoniteoturies		Negulation	& Local Gov't			

2. Landscape Linkages

Trends & Drivers			Capabilities										E	nab	lers	3														
Changing demographics / consumer demand / ageing population Emerging Markets / BRIC Growth Energy & Fuel scarcity/cost => demand for reduced consumption New Business Models Cost of boating increasing Ethical / Green consumers Green shipping Etficient use of resources New propulsion energy solutions New propulsion energy solutions NOX, SOX and Partculates regulations Pressure on Procurement & through life costs EU technical, environmental and safety standards / legislation		Supply Chain management	Service & Support	Simulation & modelling	CAE / CAD / CAM	Design processes & Modulansation	Materials technology Manufacturing technology	Design & manufacture for sustainability	Consulting	Logistics/ traffic management	Coatings technology	Command & Control	Development testing & validation Low volume manufacturing / rapid prototyping	Naval architecture	Human factors	End of life / recycling / Decommission ing	Joining technologies (eg Welding)	Systems in tegration / engineering	Life-cycle analysis	Understanding Customer / Owner / Operator needs	Skills availability	Training & Education	Funding & investment	Partnerships & Networks	International collaboration	Supply chain / logistics	Business Model Innovation	Lechnology translators Incentives to industry to adout new technology	Focussed Research programmes	
1 2 3 4 5 6 7 8 9 10 11 12 Market Opportunitie	S	1	2	3	4	5	6	7 8	89	10	11	12 1	13 14	4 15	5 16	17	18	19	20	1	2	3 4	5	6	7	8	9	10 1	1 1	2
A Easy to use Leisure Navigation System & Integrated Comms/Data	4	2	3	3	3	3	1	1 3	3 3	3	1		3	2	3	3	1	3	2	1	1	1			1	1	1	1	1	1 52
1 1 1 1 1 1	5			2	2		2	3 2	2 2		-		3 2	2			_	3		_	1			1	_		_	1	1	1 26
1 1 1 1 1 1 1 1 1 1 1	11	3	3			3				3	2	3								1		1 1	1	1	1	1	1		1	26
1 1 1 1 1 1 1 1 1	'3rd 7	3	3	2	3		3	3 3	3		2		2	3 3	3 2	3	1		3	1	1	1 1	1	1	1	1	1			48
1 1 E Lower cost construction	3	3		3	2	2	3	3 2	2 3		2		2	3 2	2	2	2	2	2	1	1	1	1	1				1		L 45
1 1 1 1 F Hull Design, Vessel Design & Aesthetics	3			3	3		3	2 2	2 3					3	3 3	1	3		1	1	1	1 1	1		1					33
4 4 4 3 3 3 2 2 2 2 2 2 2		11	9	13	13	8	12 1	2 12	2 11	6	7	3 1	10 10	0 8	3 8	9	7	8	8	5	5 4	4 4	4	4	4	3	3	3	3	3









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3. Priority Market Opportunities (summary)

Opportunities		Market Attractivene					Tri bott li	ple tom- ne	Value	Fit with UK Capabi				lity		Fit	Total
Topic	Opportunity	Global Market Size	Home (UK) market size	Strength of competition	Added Value / Margin	Cross-sector opportunity	Planet / Environmental	People / Societal	Weighted Value	Marine Industry	University / Academic	RTO / Design Services	Other Industry	Other UK resources	Timeliness	Weighted Capability	Combined Value & Fit
A	Easy to use Leisure Navigation System & Integrated Comms/Data	3	1	1	2	3	4	2		4	3	3	3	3	3		
В	Alternative fuels: Electrification, Hybrids etc	1	0	1.5	1	2	1	1		1.5	3	3	3	2	1		
С	New Leisure Marine Products for Developing Markets	4	2	2	2	0	1	2		4	4	3	3	1	2		
D	Volume/Smaller Craft (New users/3rd Age)	3	1	2	2	0	1	2		3	4	4	2	2	3		
E	Lower cost construction	2	1	1.5	2	2	2	1		1	2	3	2.5	0	1		
F	Hull Design, Vessel Design & Aesthetics	1	0	2	1	1	1	0		4	4	1	4	3	3		

See over for outputs from breakout group exploration of Priority Market Opportunities.

Key: Black text – original team input

Red text – carousel group comments



4. Capability - Ranked

Сар	abilities	Α	В	С	D	E	F	
		Easy to use Leisure Navigation System & Integrated Comms/Data	Alternative fuels: Electrification, Hybrids etc	New Leisure Marine Products for Developing Markets	Volume/Smaller Craft (New users/3rd Age)	Lower cost construction	Hull Design, Vessel Design & Aesthetics	
Ranked	capabilities (top-level grouping)							
M Total	Materials & Manufacturing							
A Total	Design & Development							
L Total	Life-cycle technologies							
I Total	Information, Communication & Control							
P Total	Propulsion, Energy & Power							
O Total	Other							
S Total	Safety & security							
C Total	Construction, Structural & Mechanical							
Ranked	capabilities (detail)							
17	Supply Chain management	2	0	3	3	3	0	
L1	Service & Support	3	0	3	3	0	0	
A1	Simulation & modelling	3	2	0	2	3	3	
A4	CAE / CAD / CAM	3	2	0	3	2	3	
A5	Design processes & Modularisation	3	0	3	0	2	0	
M1	Materials technology	1	2	0	3	3	3	
M3	Manufacturing technology	1	3	0	3	3	2	
L9	Design & manufacture for sustainability	3	2	0	3	2	2	
03	Consulting	3	2	0	0	3	3	
15	Logistics/ traffic management	3	0	3	0	0	0	
M2	Coatings technology	1	0	2	2	2	0	
M8	Command & Control	0	0	3	0	0	0	
A8	Development testing & validation	3	3	0	2	2	0	
M7	Low volume manufacturing / rapid prototyping	2	2	0	3	3	0	
A6	Naval architecture	0	0	0	3	2	3	
A3	Human factors	3	0	0	2	0	3	
L4	End of life / recycling / Decommissioning	3	0	0	3	2	1	
M5	Joining technologies (eg Welding)	1	0	0	1	2	3	
07	Systems integration / engineering	3	3	0	0	2	0	
L3	Life-cycle analysis	2	0	0	3	2	1	





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