

Technology Strategy Board





Department for Business Innovation & Skills

## **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 first of five "Deep Dive" explorations of the sector, focussing on Marine Services and ICT. The workshop took place at the Southampton University Technology on 20 September 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 30 Market Opportunities in Marine Services & ICT.

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 security and safety, the changing nature of military threat and consequent needs for marine surveillance; Climate change figured strongly in relation to adaption (eg to rising sea levels), mitigation (through renewables and greater efficiencies) and as a driver for the "Green Economy"; availability of new technologies for CAE, simulation and modelling, ICT, positioning and integrated transport were all identified as important components of a solution to these challenges, whilst changing demographics, consumer demands and the challenging cost environment were also important.

Marine Industries Roadmap & Capability Study

Technology Strategy Board Driving Innovation





# **Executive Summary (continued)**

Priority Opportunities (see section 4) were identified across a range of services and ICT areas, with a significant overlap emerging for knowledge-based services. The leading opportunities included: Maritime consulting; Ship management systems: I-ship; Training and education (including virtual training); In-service support of military and civilian vessels; Marine ICT & Information infrastructure; Decision Support Systems; Marine & Coastal environmental services; Design Services for "Green shipping" technologies; Emergency response systems (eg to natural disasters, terrorism, piracy); Recycling / Re-purposing / Decommissioning of ships, platforms, oil rigs etc.; Insurance; and Certification, Testing & Classification.

Of these, the first seven 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 in Design & Development; Information, Communication & Control; and Life-cycle technologies. Specifically important capabilities included: Simulation & modelling; Life-cycle analysis; Sub-sea technology; Naval architecture; Data management; Sensors, measurement and monitoring technology; Human factors; and Decision support systems.

The workshop also identified other key enablers for success, underpinning these capabilities as: Skills availability; Funding & investment; Understanding Customer / Owner / Operator needs; Open architectures; Safety legislation; Business Model Innovation; Environmental Regulation; and Training & Education





#### 1. Roadmap Landscape

	If M WINVERSITY OF CAMBRIDGE	Past	2011	Short term	2013	2013	Medium term	2015	2015	Long term	2020	Horizon to 2050
	Social		Ethical / Green consumers	Safety (Peopl & Cargo)	le, Ships	Changing demand /	demographics / consi ageing population	umer Urba Con	gestion & Increasin demand f	g global for seafarers		
vers	Technological	Accelerated NPD process	awables (R F D	3D CAD/0 & modellin Marine ecosyste	CAM/CAE / simulation ng / rapid tooling	Positioning & Comr Technologies	nunications Ocean resource	Rapid Technologic	al Integrated / Multi-M Transport Systems	New prop solutions	Aut syst	onomous tems
s & Dri	Environmental	15% target b	by 2020)	management& Climate change Mitigation (Low Carbon)	Sustainability Technol Migration of freight fro waterways & coastal	ology Insertion om road to inland shipping	reduced consumption	on ation, increasing	Ci Ci	limate change Ada oast & Waterways	Impact)	Opening the Green shipping
Trend	Economic	shifting trade patterns Need for disaster resilience	sources Th Se	rough life support & rvitisation	"Green Economy": env as a business opportur	<i>i</i> ronment nity	New Moo Emerging Markets /	v Business Jels	(=> Desa	lination)	recy	cling
	Political & Legal	Gaps between science, policy & implementation	Global maritime surveillance infrastr	safety	standards / legislation EU integra	ted maritime IMC	BRIC Growth	OX, SOX and articulates regulations			100% recycling of onboard waste	anging nature of
	Maritime consulting				Maritime							
s	Marine ICT			Security & Threa systems	t detection	Decision Support Systems		(Bio)-Sensor developments	Marine ICT & Informa infrastructure	tion	Ship management sys	stems: I-
Need	Training and education				Training a education	nd	-					
arket	Marine & Coastal environmental &		Systems for marine protected areas	Pollution/waste mar and control	nagement	Marine & Coast environmental	al M services p	letocean information rovision	Integrated coast	al zone	Marine & Coastal environmental services	$\rightarrow$
s & M	Marine Business services		Insurance	Certifica Classifie	ation, Testing & cation	Chartering & finance			management/pl	lanning		
unitie	Support services	JIT global logistics	n' ships	In-service support of mil civilian vessels	itary and	Business clustering chain development	and supply Recy Deco	cling / Re-purposing / ommissioning of ships,				
pport	Design services	supp	oort process	Design Services shipping" techno	for "Green blogies							
ō	Other Theme A					Emergency response natural disasters, terr	e systems (eg to rorism, piracy)					
	Other Themes				Mariculture	Migrat	tion of freight to shipping	Through services	life management of offshore assets			
	Design & Development	Simulation & Too modelling Tecl	els & Anniques	Human factors	CAE / CAD / CAM	Design proce & Modularisa	Naval	architecture	Marinisation D	evelopment testin validation	Analysis tools	>
S	Construction, Structural & Mechanical		M	echanical stems	Offs	hore wind		Sub-sea technology	Tidal & wave power			
abilitie	Materials & Manufacturing	Materials technology Con	atings chnology	Manufacturing technology	Processing techn (eg Wastewater)	ology	Joining to (eg Weldi	echnologies ng)	Lightweighting	ow volume manufa rapid prototyping	acturing	
& Cap	Propulsion, Energy & Power	Internal combustion engine technology			Electrical systems storage & power	, Power syste managemen	ms ht Propu	Ilsion ology	echanical Electri tergy & storage techn	ric drive lology		
logies	Information, Communication & Control	Sensors, measurement Co and monitoring au	ontrol, utomation &	Data management	Navigation technology	Logistics/tr manageme	affic Voya nt mana	agement	Decision support systems	Communications (LAN / Wireless)	Telecoms (wide- area)	
echno	Life-cycle technologies	Service & Support	laintenance	Life-cycle analysis	End of life / recyc / Decommissioni	ting Technolog & reconfigu	y insertion urability Cone Mon	dition itoring	Supply Chain management	In-service testing	Design & manufor sustainability	facture
Ĕ	Safety & security	Offensive & Nati	ional security	Personal safety	Active safety	Safety testing	$\rangle$					
	Other			Consulting	Risk managament & acturarial	Biotech & processin	biological Ma scie	rine life ences	Systems integration / engineering	[	Integrated Transport (e	ceanography / Environment g currents & ice caps)
	Funding & Resources		Understandin	Focussed programm	Research Funding investm	g & Major p	athfinderprojects	Business Model	Incentives to industry to adopt new technology			Marine technology
s	People & Skills	Skills availability	Owner/Opera	ator needs Profess		to esta	blish UK position	Innovation	Technology			revolution
nable	Facilities & Infrastructure		Facilities, infrastructure &	Supply chain /			Partnerships &	Oceanog research	raphic centres	ternational		
ш	Partnersnips & Supply Chain Standards & Regulation	Safetylegislation	Standards		IP security &	Open	Networks	Environmental		Ilaboration	>	
	Other			Technology transfer from other industries				Regulation	Integration with & Local Gov't	planning		

### 2. Landscape Linkages

	-	T	rene	ds	& D	riv	ers		-							_						Ca	pat	oiliti	es	_	<u> </u>						Enablers				_	_						
	EU technical, environmental and safety standards / legislation	Positioning & Communications Technologies	Global maritime surveillance infrastructure	New Business Models	Changing demographics / consumer demand / ageing population	Climate change Adaption (Resiliance / Coast & Waterways Impact)	Marine Renewables (R.E.D. 15% target by 2020)	Energy & Fuel coercitu/met => demand for reduced concumution	Elielgy & ruei scaldity/cost -> delitaria foi reduced consumption	Rapid Technological Development (ICT, bio, nano)	Recycling, Reuse & Technology Insertion				Simulation & modelling	Life-cycle analysis	Sub-sea technology	Naval architecture	Data management	Sensors, measurement and monitoring technology	numen racios Decisión summer svetems	Tools & Techniques	Analysis tools	Condition Monitoring	Systems integration / engineering	Design processes & Modularsation Control, automation & autonomy	Maintenance	Risk managament & acturarial	CAE / CAD / CAM	Service & Support	Consulting	Communications (LAN / Wireless)	Skills availability	Funding & investment	Understanding Customer / Owner / Operator needs	Open architectures	Safety legislation	Business Model Innovation	Environmental Kegulation	Training & Education	rattrietsinips & tvetworks Focussed Research programmes	r occase a redeat of programmed	Oceanographic research centres	
2	3	4	5	e	5 7	7 8	8 9	9 1	10	11	12		Market Opportunities		1	2	3	4	5	6	7	8 9	10	11	12	13 14	1 15	5 16	17	18	19	20	1	2	3	4	5	6	7	8	9 1	.0 11	1 12	2
1			1	. 1	L						1	A	Maritime Consulting (Submarine)	5	3	3	3	3		3													1			1								17
1	1	1							1	1		В	Ship Management Systems - I-Ships	6	2				3		1	<b>3</b> 2	2	3	3	2 3	8					1	1	1	1	1	1	1	1					32
1					1	1						С	Training & Education incl. Virtual training	3	3	3	3	3	1	3	3							3	3				1	1	1		1	1		1	1	1 1	1 1	1 35
		1		1	L		:	1			1	D	In-service Support of Military & Civilian Assets	4	3	3	3	1	3	3	1	3 3	1	3		2 2	2 3	1	1	3		1	1		1	1		1	1			1	1	46
1		1	1	. 1	L 1	1				1		E	Marine ICT & Information Infrastructure	7	3	2			2		3	2 3	3	2	3	2 3	8 3	8	3	2	3	3	1	1	1	1	1		1	1	1	1 1	1	52
	1		1				1	1	1			F	Decision Support Services	6	3	3			3		2	3 3	3	3	3	<b>3</b> 1	1 3	8 3		3	3	2		1	1	1	1	1					1	1 50
												G	Marine & Coastal Environmental	2																														
	1						1						Services		3		2		3	2	2	3 3	3	1	2	2 2	2 2	4	1	2	3	2	1	1					1	1	1.	1	1	45





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# 3. Priority Market Opportunities (summary)

Opportunities	Market Attractiveness:						ple tom- ne	Value	Fit	with	UK Ca	apabi	lity		Fit	Total
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
Maritime consulting	4	2	1	4	1	1	3		3	2	2	1	1	1		
Ship Management Systems - I-Ships	4	2	2	1	1	2	2		3	2	1	3	1	2		
Training & Education incl. Virtual training	3	1	2	4	0	3	3		2	4	3	3	3	1		
In-service Support of Military & Civilian Assets	4	4	2	2	3	3	1		3	3	2	3	2	2		
Marine ICT & Information Infrastructure	4	2	1	2	1	1	3		3	4	3	4	2	3		
Decision Support Services	4	2	3	4	4	2	2		1	3	3	4	4	3		
Marine & Coastal Environmental Services Monitoring	3	2	1	2	2	3	2		2	3	3	3	1	3		

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

### Key:Black text – original team inputRed text – carousel group comments





## 4 Capability - Ranked

Сар	abilities	Α	В	С	D	E	F	G							
		Marine Consulting (Submarine)	Ship Management Systems - I-ships	Training & Education incl. Virtual training	In-service Support of Military & Civilian Assets	Marine ICT & Information Infrastructure	Decision Support Services	Marine & Coastal Environmental Services	TOTAL Theme A Marine Services & ICT						
Ranked	capabilities (top-level grouping)														
A Total	Design & Development														
I Total	Information, Communication & Control														
L Total	Life-cycle technologies														
O Total	Other														
C Total	Construction, Structural & Mechanical														
P Total	Propulsion, Energy & Power														
M Total	Materials & Manufacturing														
S Total	Safety & security														
Ranked	anked capabilities (detail)														
A1	Simulation & modelling	3	2	3	3	3	3	3							
L3	Life-cycle analysis	3	0	3	3	2	3	0							
C4	Sub-sea technology	3	0	3	3	0	C	2							
A6	Naval architecture	3	0	3	1	. 0	C	0 0							
13	Data management	0	3	1	3	2	3	3							
11	Sensors, measurement and monitoring technology	3	0	3	3	0	C	2							
A3	Human factors	0	1	3	1	3	2	. 2							
17	Decision support systems	0	3	0	3	2	3	3							
A2	Tools & Techniques	0	2	0	3	3	3	3							
A9	Analysis tools	0	2	0	1	3	3	3							
L6	Condition Monitoring	0	3	0	3	2	3	1							
07	Systems integration / engineering	0	3	0	0	3	3	2							
A5	Design processes & Modularisation	0	2	0	2	2	3	2							
12	Control, automation & autonomy	0	3	0	2	3	1	. 2							
L2	Maintenance	0	0	0	3	3	3	2							
04	Risk managament & acturarial	0	0	3	1	. 0	3	0							
A4	CAE / CAD / CAM	0	0	3	1	3	C	1							
L1	Service & Support	0	0	0	3	2	3	2							
03	Consulting	0	0	0	0	3	3	3							
18	Communications (LAN / Wireless)	0	1	0	1	3	2	2							
Marine Indu	stries Roadmap & Capability Study Driving Innovation	3)	Industrie	15 Turgert	BI:	Innovatio	n & Skills	Dominic	Oughton do251@cam.ac.uk If№						