

Appendix 5 - Cross Sector Opportunities

Robotics Proposition, Department for International Trade

This document¹ has carried out an analysis of a number of opportunities (46) across 6 industry sectors. Their results have been tabulated below.

Opportunity	Health	Space	Industrial	Agriculture	Extreme Environment	Urban
Platforms for performing robotic assistance of specific parts of surgery rather than entire surgical procedures.	●					
Development of smart, miniaturised, mechatronically enhanced or robotically assisted surgical instruments.	●					
3D printing and planning technologies.	●					
Untethered microrobots.	●					
Virtual/Augmented Reality for surgery.	●					
The development of 'intelligent' prosthetics	●					
Telerobotics - the remote operation of a robot by a healthcare practitioner.	●					
Robots to assist professional carers to be more efficient, allowing them to focus more on the human-to-human aspects of their work, and reducing the physical demands of caring.	●					
Robots for Independent Living that provide general assistance around the home, for instance, performing household chores and assuring safety.	●					
Robots to help people rehabilitate following illness or injury, allowing a more rapid return to health and independent living.	●					
Therapeutic pet robots to help	●					

¹ Robotics Proposition, Department for International Trade, August 2019.

reduce stress and anxiety.						
Developing orbital and planetary robots.		●				
Interoperability between astronaut & robot.		●				
Autonomous/Intelligent Vehicles, including autonomous mission management, science autonomy, robotic control, navigation or localisation without GPS.		●				
Robotic Manipulators, including tele-operation, sampling devices, sample transfer and manipulation, rendezvous and docking.		●				
Novel Locomotion Platforms, including aerobots and climbing robots.		●				
Robotic Support of Manned Exploration, including human factors, multi-agent collaboration, in-situ resource utilisation.		●				
Robots that can assist with on demand, mass customisation of products and services.			●			
Manufacturing robots that can move beyond traditional, repetitive (and dangerous) tasks to autonomous activities that require more dexterity.			●			
Continued integration of Industry 4.0 - linking the real-life factory with virtual reality and data driven services.			●			
Breakthrough of human-robot collaboration technologies (cobots) that maximises the capabilities of both humans and machines in the production line .			●			
Simplification of robotic platforms and flexible interfaces suitable for SMEs to programme for different application needs.			●			
Smart factories.			●			
Developing field robots that				●		

can assist workers.						
Robotics for Livestock that can perform tasks such as removing animal waste, carrying foodstuff, milking, and health monitoring.				●		
Integration of autonomous systems technologies into existing farm operational equipment such as tractors.				●		
Self organising robotic systems to plant, fertilise, spray and harvest crops including complex dextrous operations.				●		
Robotic applications to augment worker productivity.				●		
Collaboration between the robotics community and industry practitioners. For example, breeding crops using robotic phenotyping to develop fruits which are easy to see and pick by robots.				●		
Robotics for food manufacturing and processing.				●		
Further refinement of technologies in sensing, manipulation and soft robotics.				●		
Autonomous robots to maintain infrastructure.					●	
Autonomous robots with the ability to perform underwater and underground inspection and repair.					●	
Robots to remove disruption from infrastructure inspection.					●	
Inspection and repair in extreme environments such off-shore wind, petrochemical installations and nuclear plants.					●	
Search and rescue for emergency response.					●	
Observation and maintenance using Unmanned Air Vehicles and Autonomous Underwater Vehicles.					●	

Cloud connected robots enabling real time monitoring and physical corrective measures for optimal use of resources.						●
Networked intelligent robotics for high variety tasks.						●
3D vision for navigation and identification in robots.						●
Natural Language processing for social robots.						●
Urban security and emergency response.						●
Robotic health services.						●
Robotics for offsite construction (Flying Factories).						●
Urban maintenance.						●
Unmanned Aerial Vehicles and Connected and Autonomous Vehicles.						●

Robotics Proposition, Department for International Trade - Opportunities by Theme (High Level Need)

The DIT opportunities were mapped to the 5 strategic themes identified during the NRN member's roadmaps to illustrate the potential for developing technologies that have wide cross-sector appeal.

Opportunity	Sensing & Perception	Mobility	Manipulation	AI & Autonomy	Human - Robot Interaction
Platforms for performing robotic assistance of specific parts of surgery rather than entire surgical procedures.	●	●	●	●	●
Development of smart, miniaturised, mechatronically enhanced or robotically assisted surgical instruments.		●	●		
3D printing and planning technologies.					
Untethered microrobots.		●			
Virtual/Augmented Reality for surgery.	●				
The development of 'intelligent' prosthetics				●	
Telerobotics - the remote operation of a robot by a healthcare practitioner.			●		
Robots to assist professional carers to be more efficient, allowing them to focus more on the human-to-human aspects of their work, and reducing the physical demands of caring.					●
Robots for Independent Living that provide general assistance around the home, for instance, performing household chores and assuring safety.		●	●		
Robots to help people rehabilitate following illness or injury, allowing a more rapid return to health and independent living.					●
Therapeutic pet robots to help reduce stress and anxiety.				●	●

Developing orbital and planetary robots.					
Interoperability between astronaut & robot.					●
Autonomous/Intelligent Vehicles, including autonomous mission management, science autonomy, robotic control, navigation or localisation without GPS.	●	●			
Robotic Manipulators, including tele-operation, sampling devices, sample transfer and manipulation, rendezvous and docking.			●		
Novel Locomotion Platforms, including aerobots and climbing robots.		●			
Robotic Support of Manned Exploration, including human factors, multi-agent collaboration, in-situ resource utilisation.					●
Robots that can assist with on demand, mass customisation of products and services.					
Manufacturing robots that can move beyond traditional, repetitive (and dangerous) tasks to autonomous activities that require more dexterity.		●	●		
Continued integration of Industry 4.0 - linking the real-life factory with virtual reality and data driven services.	●			●	
Breakthrough of human-robot collaboration technologies (cobots) that maximises the capabilities of both humans and machines in the production line .					●
Simplification of robotic platforms and flexible interfaces suitable for SMEs to programme for different application needs.					
Smart factories.				●	
Developing field robots that can assist workers.					●

Robotics for Livestock that can perform tasks such as removing animal waste, carrying foodstuff, milking, and health monitoring.		●	●		
Integration of autonomous systems technologies into existing farm operational equipment such as tractors.					
Self organising robotic systems to plant, fertilise, spray and harvest crops including complex dextrous operations.				●	
Robotic applications to augment worker productivity.					
Collaboration between the robotics community and industry practitioners. For example, breeding crops using robotic phenotyping to develop fruits which are easy to see and pick by robots.	●				
Robotics for food manufacturing and processing.			●		
Further refinement of technologies in sensing, manipulation and soft robotics.	●		●		
Autonomous robots to maintain infrastructure.					
Autonomous robots with the ability to perform underwater and underground inspection and repair.	●	●	●	●	●
Robots to remove disruption from infrastructure inspection.	●	●	●	●	●
Inspection and repair in extreme environments such as off-shore wind, petrochemical installations and nuclear plants.	●	●	●	●	●
Search and rescue for emergency response.	●	●		●	
Observation and maintenance using Unmanned Air Vehicles and Autonomous Underwater Vehicles.	●			●	
Cloud connected robots	●			●	

enabling real time monitoring and physical corrective measures for optimal use of resources.					
Networked intelligent robotics for high variety tasks.	●			●	
3D vision for navigation and identification in robots.	●			●	
Natural Language processing for social robots.				●	
Urban security and emergency response.	●	●			
Robotic health services.					●
Robotics for offsite construction (Flying Factories).		●	●		
Urban maintenance.	●	●	●		
Unmanned Aerial Vehicles and Connected and Autonomous Vehicles.	●	●	●	●	

NRN Themes and Opportunities for Development

Finally, the Themes and their specific work areas were mapped against a much larger range of industries. The table below shows the analysis where a darker colour indicates a technology that is likely to be of great interest to that industry.

This table can help the supply chain understand where technologies may have the biggest impact. It should be recognised that technology and needs change over time and that the information presented needs to be cautiously used.

