
Robots: Market Shares, Strategies, and Forecasts, Worldwide, 2014 to 2020

ROBOT MARKET EXECUTIVE SUMMARY	23
Robot Market Driving Forces	23
Robots Bring A New Industrial Revolution	25
Robot Market Driving Forces	28
Robot Target Markets	29
Robotic Trends	30
Robot Market Forecasts	34
1. MARKET ROBOT DESCRIPTION AND MARKET DYNAMICS	41
1.1 Markets	41
1.1.1 Robotic Automation Potential	41
1.1.2 Robots Find A Place in the Agriculture Industry	43
1.1.3 Robots Make Production More Efficient	44
1.1.4 Use Of Industrial Robots for Agriculture	45
1.1.5 Robotics and Automation	46
1.2 RAS Robotics and Automation (AgRA) Technical Committee	48
1.3 Transformational Robots	50

1.4 Global Economy	52
1.4.1 Robotics as Key Economic Enabler	54
2. ROBOTS MARKET SHARE AND MARKET FORECASTS	58
2.1 Robot Market Driving Forces	58
2.1.1 Robots Set To Bring A New Industrial Revolution	59
2.1.2 Tablet Apps Congruent Technology For All Robots	59
2.1.3 Peripheral Processes Become Massively More Productive	60
2.1.4 Robots Poised To Change Market Segment Economics	63
2.1.5 First Wave Of Automated Process	66
2.1.6 Robots Third Wave Of Automated Process	66
2.1.7 Robot Target Markets	72
2.2 Robot Forecasts	74
2.2.1 Robotic Trends	76
2.3 Industrial Robots / Manufacturing Robots	81
2.3.1 Regarding Industrial Robots:	82
2.3.1 Robot Density in Automotive and General Industry	91
2.3.2 Industrial Robots Market Shares	97
2.3.3 Industrial Robots Market Dollar Forecasts	99
2.3.4 Industrial Robots Market Unit Forecasts	100
2.3.5 Foxcomm Doubles Total Robotics Installed Base	101
2.3.6 Robotics End User Trends	102
2.4 Services Robots	103
2.4.1 Logistics Services Robots	105
2.4.2 Ship Container and Loading Dock Logistics Robots	105
2.4.3 Warehouse Logistics Robot	107
2.4.4 Online Sales Drive Need for Warehouse Logistics Robots	108

2.5	Military Robot Systems of Engagement Product Description	109
2.5.1	Military Ground Robots Market Shares and Market Forecasts	109
2.5.2	Defense Industry Is Entering A New Era	110
2.5.3	Military Ground Robot Market Driving Forces	114
2.5.4	Military Ground Robots Market Shares	117
2.5.5	Small Military Robot Forecasts	123
2.5.6	Mid Size Military Ground Robot Market Forecasts	125
2.5.7	Larger Military Robot Forecasts	126
2.6	UAS	127
2.6.1	General Atomics Predator® UAS	129
2.6.2	General Atomics Predator® B UAS	132
2.6.3	Military Unmanned Aerial Systems (UAS)	132
2.6.4	Unmanned Aerial Systems (UAS) Market Shares	136
2.6.5	Unmanned Aircraft Market Forecasts	138
2.6.6	Unmanned Aerial Systems (UAS), Market Total Forecasts	140
2.7	Cleaning Robot / Home Robot Market Driving Forces	141
2.7.1	Cleaning Robotics Market Driving Forces	143
2.7.2	Cleaning Robot Market Driving Forces	144
2.7.3	Cleaning Robot Markets	145
2.7.4	Cleaning Robot Market Shares	145
2.7.5	Household Vacuum, Pool Cleaner, and Gutter Robot Cleaner Market Forecasts	148
2.7.6	Vacuum Cleaner Robot Markets	152
2.7.7	Vacuum Cleaner Robot Market Shares	152
2.8	Medical Robots	153
2.8.1	CT Scanning and Radiation Therapy Delivery:	153
2.8.2	Image-Guided Radiation Therapy (IGRT)	154
2.8.3	Radiotherapy Treatment Machines	157
2.8.4	Three-Dimensional (3D) Printing Technology	158

Robots Table of Contents and List of Tables and Figures

2.8.5	Genetic Robots Made With 3D Printing Without A Human Designer	159
2.8.6	Super Cheap DNA Printer	161
2.8.7	Remote Cardiac Monitoring for Telemedicine	163
2.8.8	Cardiac Event Recording Automated Transmission and Response	163
2.8.9	CaridoNet MCOT	165
2.8.10	LifeWatch Android-Based Smartphone	166
2.8.11	Sotera Wireless ViSi Mobile	168
2.8.12	Medtronic Enhanced SmartShock Technology Devices	172
2.8.13	Medtronic ICD Defibrillators	172
2.8.14	Telemedicine Carts And Remote Monitoring	172
2.8.15	Automatic Guided Vehicles for the Hospital & Healthcare Industry	174
2.8.16	Pharmacy Robotic Automation Market	176
2.8.17	Mobile Health Consumer Apps Market	177
2.8.18	eCaring CareTracker	178
2.8.19	Aethon	179
2.8.20	Robotic Cloud-Computing Infrastructure for Healthcare	179
2.8.21	Healthcare Smartphone-Based Robots	179
2.9	Surgical Robots	180
2.9.1	Surgical Robot Market Driving Forces	180
2.9.2	Robotics Market Driving Forces	180
2.9.3	Healthcare Robotics Enabling Technology	182
2.9.4	Robotic-Assisted Minimally Invasive Surgery Market	183
2.9.5	Robotic-Assisted Minimally Invasive Surgery Market Shares	185
2.9.6	Intuitive Surgical Robotics da Vinci® Surgical System	190
2.9.7	Intuitive Surgical	190
2.9.8	Intuitive Surgical da Vinci Surgical System U.S. Procedures	193
2.9.9	Hansen Medical	197
2.9.10	Curexo Robodoc	199
2.9.11	iRobot and InTouch Health	199

2.9.12	MAKO Surgical	199
2.9.13	Accuray	200
2.9.14	Accuray Q3 FY 2012 Results	201
2.10	Robot Car and Truck Markets	202
2.10.1	Robot Car and Truck Market Driving Forces	203
2.10.2	Robot Car and Truck Market Leaders	206
2.10.3	Robot Car and Truck Market Forecasts	209
2.10.4	Automotive Market Discussion	213
	Electric Vehicle EV Wireless Charging Market Forecasts	217
2.10.5	Discussion of Various Size Military Robot Market Strengths and Challenges	220
2.11	Rehabilitation Robots, Active Prostheses, and Exoskeletons	220
2.11.1	Walking Assistive Robots And Exoskeletons	221
2.11.2	Exoskeleton-Based Rehabilitation	221
2.11.3	Rehabilitation Robot Market Driving Forces	222
2.11.4	Rehabilitation Robot And Motorized CPM Equipment	227
2.11.5	Chattanooga Active-K CPM (Continuous Passive Motion), CAM therapy (Controlled Active Motion) and the onboard protocols	229
2.11.6	Rehabilitation Robot Medical Conditions Treated	232
2.11.7	Rehabilitation Therapy Robotics Market	232
2.11.8	Robotic Modules for Disability Therapy	233
2.11.9	Wearable Robotics for Disability Therapy	234
2.11.10	Rehabilitation Robots Leverage Principles Of Neuroplasticity	235
2.11.11	Rehabilitation Robot Market Shares	236
2.11.12	Rehabilitation Robot Market Forecasts	237
2.11.1	Rehabilitation Robot Medical Conditions Treated	239
2.11.2	Robotic Modules for Disability Therapy	239
2.11.3	Wearable Robotics for Disability Therapy	240
2.11.4	Rehabilitation Robots Leverage Principles Of Neuroplasticity	241

2.12	Agricultural Robots	243
2.12.1	Agricultural Robot Market Shares	247
2.12.2	Lely Group Strengths, Challenges, and Revenue	249
2.12.3	Use Of Standard Industrial Robots In Agriculture	251
2.12.4	Kuka	252
2.12.5	Fanuc	252
2.12.6	Agrobot High Value Crop Robotic Automation	253
2.12.7	John Deere Autonomous Tractors	253
2.12.8	Harvest Automation	255
2.12.9	Vision Robotics	259
2.12.10	High Value Fruit Crops: Strawberries	260
2.12.11	Nursery And Garden Products	260
2.12.12	Ornamental Plant Markets	260
2.12.13	Golf courses Robotic Mowing	261
2.12.14	Crop Dusting With Remote-Controlled Helicopters	262
2.12.15	Distributed Robotics Garden	266
2.12.16	Cultibotics	267
2.12.17	Robot Vision Pruning Systems	269
2.12.18	Agricultural Robot Market Forecasts	269
2.12.19	Robot Market Segments	274
2.12.20	Cost Structures and Roles of Robots	282
2.13	Nuclear Robots Leverage Rapid Safe Response	283
2.13.1	Nuclear Response Robot Market Driving Forces	285
2.13.2	Nuclear Response Robot Market Shares	287
2.13.3	Selected Leading Nuclear First Responder Robots	290
2.13.4	Energid / Mitsubishi Next-Generation Robot for Nuclear Power Plant Heat Exchanger Tube Inspection	292
2.13.5	Northrop Grumman	293
2.13.6	Nuclear Robot Market Forecasts	294

2.14	Snake Robots Markets	298
2.14.1	Snake Robot Market Driving Forces	299
2.14.2	Snake Robots Market Shares	300
2.14.3	Snake Robot Market Forecasts	302
2.14.4	Snake Robots Market Industry Segments	304
2.15	Robot Regional Analysis	305
2.15.1	Production of Robotics in China	306
2.15.2	Chinese Machinery	307
2.15.3	Robots in Africa	307
	WINTERGREEN RESEARCH,	312
	WinterGreen Research Research Methodology	313
	ROBOT PRODUCT EXECUTIVE SUMMARY	360
	Robot Market Driving Forces	360
3.	ROBOTIC PRODUCT DESCRIPTION	364
3.1	Robotic Manufacturing Equipment	364
3.1.1	ABB	366
3.1.2	Kawasaki Robotics	366
3.1.3	Fanuc	366
3.1.4	Yaskawa Motoman	367

3.2	ABB	370
3.2.1	ABB Addresses Demand for Power Distribution Systems And Equipment	373
3.2.2	ABB Addresses Major Trends In Industry Robotics	374
3.3	Kawasaki Robotics	374
3.4	Fanuc	378
3.5	Yaskawa Motoman	383
3.6	Kuka Robots	395
3.6.1	Kuka Customer Production Focus	396
3.7	Denso Wave	404
3.8	Stäubli Robotics: Innovative SCARA and 6-Axis Robots And Software Solutions	405
3.9	Logistics Services Robots	406
3.9.1	Amazon Kiva Mobile-Robotic Fulfillment System	409
3.9.2	Swisslog WarehouseRunner for Storage and Retrieval: Increase Efficiency Throughout the Warehouse	409
3.9.3	C&D Robotics ATL Automatic Truck Loading	410
3.9.4	Motoman Robotic Truck Unloading and Mixed-Case Depalletizing	411
3.9.5	Yaskawa Motoman Packaging	415
3.9.6	Yaskawa Motoman Palletizing	417

3.10 Military Robot Systems of Engagement



	419	
3.10.1	Military Robots Delivering Offensive and Defensive Capabilities to Combat Teams	419
3.10.2	Selected Leading Military Robots	420
3.10.3	Northrop Grumman	422
3.10.4	Northrop Grumman Cutlass	423
3.10.5	Northrop Grumman Mini-ANDROS II	424
3.10.6	Military Ground Robot Market Forecasts	425
3.11	iRobot	427
3.11.1	iRobot® 510 PackBot® for EOD Technicians	428
3.11.2	iRobot® PackBot® 510 for Infantry Troops	430
3.11.3	iRobot® PackBot® 510 for Combat Engineers	431
3.11.4	iRobot 710 Warrior™	432
3.11.5	iRobot® 110 FirstLook®	434
3.11.6	iRobot® SUGV	436
3.11.7	iRobot® 1KA Seaglider™	438
3.11.8	iRobot Defense and Security	439
3.12	Northrop Grumman	440
3.12.1	Northrop Grumman CUTLASS	440

3.13	Homeland Security Robots	441
3.14	General Dynamics Robotic Systems	442
3.14.1	General Dynamics Mobile Detection	442
3.14.2	General Dynamics Tactical Autonomous Combat – Chassis (TAC - C)	445
3.15	Vacuum and Household Cleaning Robots	446
3.16	iRobot Roomba®	446
3.16.1	iRobot Home Cleaning Robots	449
3.16.2	iRobot Real World Environment Dynamic Robotic Operations	451
3.16.3	iRobot Allows Users To Interact And Instruct Movement In Intuitive Ways	451
3.16.4	iRobot Products For Home Cleaning	452
3.17	Matsutek	454
3.18	Yujin Robotics	459
3.18.1	Yujin Robotic Vacuum Cleaner	460
3.19	Samsung VC-RM72VR Dual CPU Automatic Robot Vacuum	462
3.19.1	Samsung Robot Vacuum Navigation Research	468
3.20	LG Hom-Bot	469
3.21	Home, Pool, and Gutter Cleaning Robot Products	473
3.22	Robotic Surgery Medical Robots	473
3.22.1	Robot-Assisted Surgery	474
3.23	Intuitive Surgical Robotics da Vinci® Surgical System	478
3.23.1	Intuitive Surgical	478
3.23.2	Restoration Robotics	480
3.24	Hansen Medical	481

3.25	Curexo Robodoc	482
3.26	MAKO Surgical	482
3.27	Blue Belt Technologies	482
3.28	Accuray	484
3.29	Restoration Robotics	485
3.30	Titan Robot	487
3.30.1	Titan Robot	488
3.31	Telemedicine	494
3.32	iRobot and InTouch Health	496
3.33	Global Med Telehealth: Benefits of Video Conferencing	497
3.33.1	GlobalMed Telemedicine Products Telehealth Equipment Medical Technology	497
3.33.2	GlobalMed Telemedicine Carts Telehealth Carts	497
3.33.3	GlobalMed i8500™ Mobile Telemedicine Station	500
3.33.4	GlobalMed TES (Transportable Exam Station)	500
3.33.5	GlobalMed FirstExam™ Mobile Telemedicine Station	502
3.33.6	GlobalMed TotalExam™ HD Examination Camera	505
3.33.7	GlobalMed Diagnostic Imaging Medical Imaging	505
3.34	Bosch Healthcare Telemedicine Solutions	506
3.34.1	Bosch Healthcare, Bosch Telemedicine and Care Solutions	507
3.34.2	Bosch Healthcare Supports Independent Living At Home	508
3.34.3	Bosch Telemedicine Solutions	508
3.34.4	Bosch Telemedicine Provides Daily Care for Patients with Chronic Conditions	509
3.34.5	Bosch Devices for Patients with Diabetes	509
3.34.6	Bosch Health Buddy Decision Support Tools	511

3.34.7	Bosch Patient Support System	513
3.35	Siemens / Kuka Robotic xRay System	514
3.36	Kuka Positioning for Service Robot Industry	514
3.36.1	Kuka Strategy for Medical Robots	516
3.37	Metra Labs Mobile Robot	518
3.38	Medical Logistics Robots	519
3.39	Aethon TUG Medical Logistics Robots	522
3.40	iRobot and Cisco Remote Presence Robot	523
3.41	Personal and Educational Robots	524
3.42	Unbounded Robotics	524
3.43	Robotic Entertainment Systems	526
3.44	Rehabilitation Robots, Active Prostheses, and Exoskeleton Products	527
3.44.1	Stroke	527
3.44.2	Early Rehab After Stroke	527
3.44.3	Multiple sclerosis	528
3.44.4	Knee-Replacement Surgery	528
3.44.5	Hip	529
3.44.6	Gait Training	530
3.44.7	Sports Training	531
3.44.8	Severe Injury or Amputation	531
3.44.9	Neurological Disorders	532
3.44.10	Recovery After Surgery	532
3.44.11	Gait Training Devices / Unweighting Systems	533

3.44.12	Neuro-Rehabilitation	534
3.44.13	Prostheses	536
3.44.14	Motorized Physiotherapy CPM (Continuous Passive Motion), CAM Therapy (Controlled Active Motion) and the Onboard Protocols	536
3.44.15	Gait Training Devices / Unweighting Systems / Automated Treadmills	536
3.45	Hocoma Products	537
3.45.1	Hocoma's Lokomat Gait Orthosis Automates Locomotion Therapy On A Treadmill	537
3.45.2	Hocoma Rehabilitation Robotics	539
3.45.3	Hocoma Lokomat Robotic Gait-Training Device Aims To Change The Part Of The Brain That Controls Motor Function	542
3.45.4	Hocoma Lokomat Functional Electrical Stimulation	543
3.45.5	Hocoma Lokomat Advanced Motion Analysis	543
3.45.6	Hocoma ArmeoSpring Based On An Ergonomic Arm Exoskeleton	547
3.46	Biodex Unweighting Systems	547
3.47	Honda Gait Training	548
3.48	Ekso Bionics	552
3.48.1	Ekso Bionics HULC Technology Licensed to the Lockheed Martin Corporation	553
3.48.2	Ekso Bionics Regional Presence	553
3.48.3	Ekso Gait Training Exoskeleton Uses	556
3.48.4	Ekso Bionics Robotic Suit Helps Paralyzed Man Walk Again	561
3.49	Wearable Robots:	562
3.50	Autonomous Vehicles / Robot Cars	563
3.50.1	Robot Cars And Trucks Global Markets	564
3.50.2	Robot Cars And Trucks Operations And Performance	566
3.50.3	Robot Cars And Trucks Business and Technology Trends	566
3.50.4	Wireless Car Charging	567

3.50.5	Vehicle Sharing	568
3.51	General Dynamics Robotic Systems	571
3.51.1	General Dynamics Mobile Detection	572
3.51.2	General Dynamics Tactical Autonomous Combat – Chassis (TAC - C)	575
3.52	Northrop Grumman	576
3.52.1	Northrop Grumman Cutlass	577
3.52.2	Northrop Grumman Mini-ANDROS II	578
3.53	IBM	579
3.53.1	IBM / Ford Automotive Vehicle System M2M	579
3.53.2	IBM / Ford	580
3.53.3	Ford Leveraging IBM Partnership, Using Sensors	581
3.53.4	IBM Smarter Planet Strategy	581
3.54	Ford Self Driving Car	582
3.54.1	Ford Robotic Auto Control System	583
3.54.2	Ford Robotically Controlled Vehicles On Test Track	585
3.55	Toyota Production LS 2013 Model Self-Driving Tools Technology	585
3.56	Hyundai Genesis Smart Cruise Control	586
3.57	Nissan	586
3.58	BMW	587
3.59	Daimler AG / Mercedes-Benz Self Driving Car	587
3.60	GM Chevrolet Impala 2014	588
3.61	Kairos Autonami Pronto4	588

Robots Table of Contents and List of Tables and Figures

3.62	Google	589
3.55.1	Google Self-Driving Car	592
3.55.2	Google Self-Driving Car from Auto Components	592
3.63	Humanoid Robot	593
3.64	Honda Motor ASIMO Humanoid Robot	593
3.65	Kawada Industries Robotics Humanoid	595
3.66	Vecna Bear Robot	595
3.67	Agricultural Robots	597
3.67.1	Farm Bots Pick, Plant and Drive	598
3.67.2	Relying On Illegal Immigrants Can Be A Legal Liability	598
3.67.3	Nursery & Greenhouse Sector	599
3.67.4	Harvest Automation Labor Process Automation	599
3.67.5	The Growing Season Is Also Shipping Season	600
3.67.6	Improving Nursery Efficiency	601
3.67.7	Small Mobile Robot for Plants and Shrubs	601
3.67.8	Producers Seek To Improve Operations	602
3.67.9	Increasing Cows Days Of Grazing	604
3.67.10	cRops (Clever Robots for Crops) Robots To Harvest High Value Crops	607
3.67.11	European Union Seventh Framework Program	608
3.68	Strawberries	609
3.68.1	Strawberries in the US	609
3.69	John Deere Autonomous Tractor	611
3.69.1	John Deere Crop Spraying	614
3.70	Kuka	615
3.70.1	Kuka Robots in the Food Processing Industry	618

3.71	FANUC	624
3.71.1	Fanuc Vegetable Sorting Robot	624
3.71.2	FANUC Robodrill DiA5 Series	626
3.72	ABB Robots	628
3.72.1	ABB Symphony Plus	628
3.73	Yaskawa	630
3.73.1	Yaskawa Industrial AC Drives 1/8 thru 1750 Horsepower	632
3.73.2	Yaskawa Specialty Pump Drives 3/4 thru 500 Horsepower	633
3.73.3	Yaskawa Servo Systems and Motion Controllers	634
3.73.4	Motoman Robot Handling and Palletizing Bags of Livestock Feed	634
3.73.5	Motoman Agriculture Robotics Palletizing Bags Solution	636
3.73.6	Motoman Robotics Robot Palletizing Bags Fixtures / Tooling Details	637
3.73.7	Motoman Grain Bin Dryer Fan Wheels	637
3.73.8	Motoman Robotics Fixtures/Tooling Details	640
3.73.9	Motoman Irrigation Pipe	640
3.73.10	Motoman Robotics Fixtures/Tooling Details	643
3.73.11	Motoman Equipment	643
3.73.12	Motoman Robotics Fixtures/Tooling Details	647
3.73.13	Motoman Round Baler Pickup Frames for Equipment	647
3.73.14	Motoman Robotics Fixtures/Tooling Details	650
3.73.15	Motoman Skid Steer Loader Mount Plates	650
3.73.16	Motoman Bags of Livestock Feed	653
3.73.17	Motoman Robotics Fixtures/Tooling Details	656
3.74	Harvest Automation	656
3.74.1	Harvest Automation Technology	661
3.74.2	Harvest Automation Behavior-Based Robotics	661
3.75	Robotic Harvesting	661

3.75.1	Robotic Harvesting Strawberry Harvester	662
3.76	Agrobot SW 6010	664
3.76.1	Agrobot AGB: Harvesting High Level System	665
3.76.2	Agrobot AG Vision	667
3.77	Blue River Technology	668
3.77.1	Blue River Precision Lettuce Thinning - 40/42" Beds	669
3.77.2	Blue River Precision Lettuce Thinning - 80/84" Beds	672
3.77.3	Lettuce Bot, Blue River Technology	673
3.78	cRops (Clever Robot for Crops)	673
3.78.1	cRops European Project, Made Up Of Universities And Labs	675
3.79	Jaybridge Robotics Agriculture	678
3.79.1	Jaybridge Robotics Kinze Partnering, Autonomous Vehicle Row Crop Harvesting	679
3.79.2	Jaybridge Software Expertise	680
3.80	Tractor Harvesting	680
3.81	iRobot's Automatic Lawn Mower	682
3.82	MIT Autonomous Gardener Equipment Mounted On The Base of a Roomba	684
3.83	Carnegie Mellon University's National Robotics Engineering Center	685
3.83.1	Carnegie Mellon. Self-Guided Farm Equipment	686
3.84	Shibuya Seiko Co.	688
3.84.1	Shibuya Seiko Co. Strawberry Picking Robot	688
3.84.2	Shibuya Seiko Robot Can Pick Strawberry Fields	688
3.85	Vision Robotics	689
3.85.1	Vision Robotics Automated Tractors	691

3.86	Australian Centre for Field Robotics Herder Robot	692
3.86.1	Robotic Rover Herds Cows	694
3.87	Lely Automatic Milking Robots	695
3.87.1	Lely Astronaut Milking Robots	695
3.87.2	Lely Concept and Management	697
3.87.3	Lely Correct Feed Management	698
3.87.4	Lely Large Dairy Farms	699
3.87.5	Lely Milk Robots At Large Dairy Farms	699
3.87.6	Lely Free Cow Traffic	705
3.88	Yamaha Crop Dusting Drones	707
3.89	Snake Robots	708
4	ROBOT TECHNOLOGY	720
4.1	Nanotechnology	720
4.2	Sensor Technology	720
4.2.1	Robot System Architecture	721
4.2.2	Automation Technology Replaces Manual Labor Tasks	722
4.2.3	Behavior-Based Robotics	722
4.2.4	Proprietary Sensor Technology	722
4.2.5	System Design & Architecture	723
4.3	Welding Robots	723
4.4	Material Handling Robots:	724
4.5	Plasma Cutting Robots:	724
4.6	Robotics and Automation Scope:	725

4.6.1	IEEE Standards Initiatives	728
4.6.2	Delft Robotics Institute	728
4.7	Robotics and Automation	730
4.8	An Electronic System Improves Different Agriculture Processes	733
	WINTERGREEN RESEARCH,	734
	WinterGreen Research Research Methodology	735
	ROBOT COMPANY MARKET DESCRIPTION, 2014 TO 2020, PART 3: COMPANY DESCRIPTION	741
	ROBOT MARKET EXECUTIVE SUMMARY	771
	Robot Market Driving Forces	771
5	ROBOT COMPANY DESCRIPTION	775
5.1	ABB Robotics	775
5.1.1	ABB Revenue	776
5.1.2	ABB Strategy	782
5.1.3	ABB Global Leader In Power And Automation Technologies	782
5.1.4	ABB and IO Deliver Direct Current-Powered Data Center Module	783
5.1.5	ABB / Validus DC Systems DC Power Infrastructure Equipment	784
5.1.6	ABB Technology	786
5.1.7	ABB Global Lab Power	786

5.1.8	ABB Global Lab Automation	787
5.2	Accuray	789
5.2.1	Accuray Products	790
5.2.2	Accuray CyberKnife System	790
5.2.3	Accuray Strategy	792
5.2.4	Accuray International Presence	795
5.2.5	Accuray Competition	795
5.2.6	Accuray Revenue	798
5.2.7	Accuray Installed Base	802
5.2.8	New Data Validates CyberKnife SBRT for Prostate Cancer Treatment	804
5.3	Aethon	804
5.4	Agrobot	808
5.4.1	Agrobot Innovation and Technology for Agribusiness	809
5.5	Allen Vanguard	813
5.5.1	Allen Vanguard Rapid Development	815
5.6	Audi	820
5.6.1	Audi Gets The Second Driverless Car Permit In Nevada	820
5.7	BAE Systems	820
5.8	Blue Belt Technologies.	825
5.9	Blue River Technology	826
5.9.1	Blue River / Khosla Ventures	827
5.10	Bosch Group	827
5.10.1	Evatran Group Plugless Sales Go Live with Bosch	828
5.10.2	Bosch Business Overview	829

Robots Table of Contents and List of Tables and Figures

5.10.3	Bosch Group Reorganized Its Business Sectors	830
5.10.4	Bosch Consumer Goods sales	831
5.10.5	Bosch Automotive Technology sales	831
5.10.6	Bosch Industrial Technology Sales	832
5.10.7	Bosch Group	832
5.10.8	Bosch Healthcare Supports Independent Living At Home	833
5.10.9	Bosch Security Systems Division	834
5.10.10	Robert Bosch Healthcare	834
5.10.11	Robert Bosch Remote Patient Monitoring	835
5.10.12	Bosch Healthcare Telehealth Systems	836
5.10.13	Bosch Healthcare Health Buddy System	838
5.10.14	Bosch Addresses Role of Compliance in Telehealth Adoption	838
5.10.15	Bosch North America Veterans Health Administration	839
5.10.16	Bosch / VRI	842
5.10.17	Bosch Healthcare and GreatCall Partnership	843
5.10.18	Bosch Healthcare - Telehealth And Care Solutions Join To Become The Leading Provider Of Health, Safety, And Communication	843
5.10.19	Bosch Group and Health Hero Network	844
5.11	BMW	845
5.11.1	BMW Strategy	846
5.11.2	BMW Revenue	846
5.12	Buick Group	847
5.13	Chrysler / Dodge	850
5.13.1	Chrysler Revenue	850
5.14	Daimler AG / Mercedes-Benz	851
5.14.1	Daimler AG Revenue	852
5.15	Denso Wave	853

5.16	ECA Robotics	854
5.17	Elbit Systems	855
5.17.1	Elbit Systems Principal Market Environment	856
5.17.2	Elbit Systems	857
5.17.3	Elbit Systems Principal Market Environment	858
5.18	Evatran Group	860
5.19	Exogenesis	860
5.19.1	Exogenesis Technology	861
5.20	Fanuc	862
5.20.1	FANUC Corporation	867
5.20.2	Fanuc Revenue	869
5.21	Ford / Lincoln	872
5.21.1	Ford Business	873
5.21.2	Ford Motor Vehicle Fuel Economy	875
5.21.3	Ford Revenue	875
5.22	General Dynamics	876
5.22.1	Sequester Mechanism	877
5.22.2	General Dynamics Revenue	877
5.22.3	General Dynamics Robotic Systems	878
5.22.4	General Dynamics Robotic Systems (GDRS) Vision	879
5.22.5	General Dynamics Robotic Systems (GDRS) Manufacturing	879
5.22.6	General Dynamics Autonomous Land And Air Vehicle Development	880
5.23	General Electric	881
2.1.1	GE Unmanned Aircraft	884
2.1.2	GE Supports Innovation	885

2.1.3	GE Energy –	885
2.1.4	GE Energy	886
2.1.5	General Electric Company Energy Infrastructure Revenues	888
2.1.6	GE Total Revenue	889
2.1.7	General Electric Geographic Revenues	890
2.1.8	GE and Göteborg Energi	890
2.1.9	GE’s 4.1-113 Wind Turbine	891
2.1.10	General Electric Offers Wind Turbine Customers Clean Energy From Solar Panels	893
2.1.11	GE U.S. Wind Crash	894
2.1.12	GE Technology to Boost the Output of NextEra Energy Resources’ U.S. Fleet of Wind Turbines	895
2.1.13	GE Energy Financial Services	896
5.23.1	GE Intelligent Platforms	897
5.24	Google	898
5.24.1	Google / Boston Dynamics	899
5.24.2	Boston Dynamics	900
5.24.3	Boston Dynamics LS3 - Legged Squad Support Systems	901
5.24.4	Boston Dynamics CHEETAH - Fastest Legged Robot	903
5.24.5	Boston Dynamics Atlas - The Agile Anthropomorphic Robot	904
5.24.6	Boston Dynamics BigDog	906
5.24.7	Boston Dynamics LittleDog - The Legged Locomotion Learning Robot	907
5.24.8	Google Robotic Division	909
5.24.9	Google Self-Driving Car	909
5.24.10	Google Cars Address Vast Majority Of Vehicle Accidents Due To Human Error	911
5.24.11	Google Business	912
5.24.12	Google Corporate Highlights	913
5.24.13	Google Search	914
5.24.14	Google Revenue	915
5.24.15	Google Second Quarter 2013 Results	916

5.24.16	Google Revenues by Segment and Geography	919
5.24.17	Google / Motorola Headcount	920
5.24.18	Google / Motorola	920
5.25	Hansen Medical	921
5.25.1	Hansen Medical Sensei System	923
5.25.2	Hansen Medical Magellan Robotic System	924
5.25.3	Hansen Medical Competition	925
5.25.4	Hansen Medical Revenue	926
5.25.5	Hansen Medical Business	928
5.25.6	Accuray 2013 First Quarter Financial Results	930
5.26	Harvard Robobee	933
5.26.1	Harvard Robobee Funding	933
5.26.2	Harvard Robobee Main Area Of Research	935
5.26.3	Harvard Robobee OptRAD is Used as an Optimizing Reaction-Advection-Diffusion System	935
5.26.4	Harvard Robobee The Team	936
5.27	Harvest Automation	937
5.27.1	Harvest Automation Ornamental Horticulture	938
5.27.2	Harvest Automation M Series C Financing	938
5.27.3	Harvest Robotic Solutions	939
5.27.4	Harvest Automation Robots	939
5.28	GM / Cadillac	942
5.28.1	GM Business	943
5.28.2	GM Strategy	944
5.28.3	GM Revenue	945
5.29	Honda	946
5.30	Hyundai	947

5.31	InTouch Health	948
5.32	Intuitive Surgical	949
5.32.1	Intuitive Surgical Robotics da Vinci® Surgical System	953
5.32.2	Intuitive Surgical Business Strategy	954
5.32.3	Intuitive Surgical Products	957
5.32.4	Intuitive Surgical Patient Value As Equal To Procedure Efficacy / Invasiveness	957
5.32.5	Intuitive Surgical Business Model	960
5.32.6	Intuitive Surgical Revenue	960
5.32.7	Intuitive Surgical Regulatory Activities	962
5.32.8	Intuitive Surgical Economic Environment.	962
5.32.9	Intuitive Surgical da Vinci Si Surgical System Market Acceptance	963
5.32.10	Intuitive Surgical Technology and Acquisitions	966
5.33	iRobot	966
5.33.1	iRobot Home Robots:	967
5.33.2	iRobot Defense and Security: Protecting Those in Harm’s Way	967
5.33.3	iRobot Role In The Robot Industry	968
5.33.4	iRobot SPARK (Starter Programs for the Advancement of Robotics Knowledge)	968
5.33.5	iRobot Revenue	969
5.33.6	iRobot Acquires Evolution Robotics, Inc.	970
5.33.7	iRobot / Evolution Robotics	971
5.33.8	iRobot Strategy	971
5.33.9	iRobot Technology	974
5.34	Kawada Industries	975
5.35	Kawasaki Robotics	976
5.36	Kongsberg	977
5.36.1	Kongsberg Defence Systems Revenue	978

5.34	Kuka	979
5.34.4	Kuka Revenue	980
5.34.5	Kuka Competition	982
5.34.6	Kuka Innovative Technology	984
5.34.7	Kuka Well Positioned With A Broad Product Portfolio In Markets With Attractive Growth	
Prospects	984	
5.34.8	Kuka Strategy	985
5.34.9	Kuka Corporate Policy	986
5.34.10	Kuka Customers	992
5.35	Lely	994
5.35.1	Lely Revenue	994
5.35.2	Lely / Astronaut	994
5.37	Lockheed Martin	996
5.37.1	Lockheed Martin Symphony Improvised Explosive Device Jammer Systems	999
5.37.2	Lockheed Martin Aeronautics Revenue	999
5.37.3	Lockheed Martin Electronic Systems	1004
5.37.4	Lockheed Martin	1005
5.37.5	Lockheed Martin Revenue	1005
5.36	MAKO Surgical	1006
5.36.1	Mako Surgical Business	1007
5.36.2	Mako Products	1007
5.36.3	Mako Surgical Strategy	1010
5.36.4	Mako Surgical Revenue	1014
5.37	Medrobotics	1014
5.37.1	Medrobotics Closes On \$10 Million Financing From Hercules	1015
5.37.2	Medrobotics Several Generations Of Snake Robot Platforms	1016
5.37.3	Medrobotics Advances Clinical Development of Snake Robot for Surgery	1017

Robots Table of Contents and List of Tables and Figures

5.37.4	Medrobotics Positioning	1017
5.37.5	Medrobotics Cardiac Surgery Gold Standard	1017
5.37.6	Medrobotics Snake Robot Technologies For Use In A Wide Range Of Surgical And Interventional Applications	1019
5.37.7	Medrobotics Technology & Research Center	1020
5.38	Mesa Robotics	1021
5.38.1	Systems Development Division of Mesa Associates	1021
5.38.2	Mesa Robotics Affordable Robotic Solutions	1023
5.38.3	Mesa Robotics Revenue	1024
5.39	Mitsubishi	1025
5.40	Nissan	1025
5.40.1	Nissan Revenue	1026
5.41	Northrop Grumman	1028
5.41.1	Northrop Grumman Revenue	1029
5.41.2	Northrop Grumman Remotec	1030
5.41.3	Northrop Grumman Leading Global Security Company	1031
5.41.4	Northrop Grumman Supplies Marine Navigation Equipment	1034
5.41.5	Northrop Grumman Recognized by UK Ministry of Defense for Role in Supporting Sentry AWACS Aircraft During Military Operations in Libya	1035
5.41.6	Northrop Grumman Corporation subsidiary Remotec Inc. upgrade the U.S. Air Force fleet of Andros HD-1	1035
5.41.7	Northrop Grumman NAV CANADA Supplier	1036
5.42	Qualcomm	1037
5.42.1	Qualcomm Business	1038
5.42.2	QMC Offers Comprehensive Chipset Solutions	1038
5.42.3	Qualcomm Government Technologies	1039
5.42.4	Qualcomm Internet Services	1040

5.42.5	Qualcomm Ventures	1042
5.42.6	Qualcomm Revenue	1044
5.42.7	Qualcomm / WiPower	1045
5.42.8	Qualcomm Standardization Capabilities	1046
5.42.9	Qualcomm Regulatory and Compliance Capabilities	1046
5.43	QinetiQ	1047
5.43.1	QinetiQ Comprised Of Experts	1047
5.43.2	QinetiQ North America TALON Detects Deadly IEDs And Saves Lives	1047
5.43.3	QinetiQ World-Leading Products:	1049
5.43.4	QinetiQ Innovation	1050
5.43.5	QinetiQ North America	1052
5.43.6	QinetiQ Revenue	1053
5.43.7	QinetiQ Vision	1059
5.43.8	QinetiQ Mission	1059
5.43.9	QinetiQ / Foster Miller	1059
5.43.10	QinetiQ / Foster Miller Financial Position	1061
5.43.11	QinetiQ North America Order for 100 Dragon Runner 10Micro Robots:	1063
5.43.12	QinetiQ / Automatika	1065
5.43.13	QinetiQ Customer Base	1066
5.44	Re2, Inc	1069
5.44.1	Re ² Leading Developer	1072
5.44.2	Re2 Forerunner High Speed Inspection Robot	1074
5.44.3	Re2 ForeRunner RDV	1075
5.44.4	Re2 HST - High-Speed Teleoperation	1075
5.45	ReconRobotics	1076
5.45.1	ReconRobotics Tactical, Micro-Robot Systems	1077
5.46	ReWalk Robotics	1078

5.47	Shibuya Seiki	1079
5.47.1	Shibuya Kogyo Pharmaceutical Applications	1080
5.47.2	Shibuya Kogyo Robotic System For Handling Soft Infusion Bags	1081
5.47.3	Shibuya Kogyo Robotic Cell Culture System "CellPRO"	1082
5.47.4	Shibuya Kogyo Robotic System For Leaflet & Spoon Placement	1082
5.47.5	Shibuya Kogyo Robotic Collating System	1084
5.47.6	Shibuya Kogyo Automated Aseptic Environmental Monitoring System	1085
5.48	Stäubli	1086
5.48.1	Stäubli Industrial Robots	1087
5.48.2	Stäubli Controllers	1087
5.48.3	Stäubli Software	1087
5.49	Telerob	1088
5.49.1	Telerob	1088
5.50	Thales Group	1089
5.50.1	Thales Core Businesses	1089
5.50.2	Thales: - A Global Player	1089
5.50.3	Thales Revenue	1091
5.50.4	Thales Key Technology Domains	1092
5.50.5	Thales Open Research	1092
5.50.6	Thales Stance on Environment	1093
5.50.7	Thales Processes	1093
5.50.8	Thales Product Design	1093
5.50.9	Thales Site Management	1093
5.50.10	Thales Alenia Space Integration Of Service Module For The Fourth ATV	1094
5.50.11	Thales Sonar 'Excels' In Anti-Submarine Warfare Exercise	1096
5.50.12	Thales Group Ground Alerter 10	1097
5.50.13	Thales Group Ground Master 400 (GM 400)	1098
5.50.14	Thales / Raytheon Systems Ground Master 400	1099

5.50.15	Thales Group Ground Smarter 1000	1100
5.50.16	Thales Group	1101
5.51	Toyota / Lexus	1102
5.51.1	Toyota	1103
5.23.1	Toyota Avalon Wireless Charging Pad	1103
5.23.2	Toyota / Lexus	1106
5.23.3	Toyota Revenue	1108
5.52	Vecna Technologies	1108
5.53	Volkswagen	1109
5.53.1	Volkswagen Revenue and Shipments	1109
5.53.2	Volkswagon Brands	1112
5.53.3	Porsche SE	1113
5.54	Volvo	1114
5.54.1	Volvo Revenue	1114
5.55	Visteon	1115
5.55.1	Visteon Competition	1117
5.55.2	Visteon Revenue	1118
5.56	WiTricity	1119
5.57	Yamaha	1121
5.58	Yaskawa	1124
5.58.1	Yaskawa Revenue	1124
5.58.2	Yaskawa Business	1125
5.58.3	Yaskawa Electric Motion Control	1127
5.58.4	Yaskawa Electric Robotics	1127
5.58.5	Yaskawa Electric System Engineering	1127


Robots Table of Contents and List of Tables and Figures

5.58.6	Yaskawa Electric Information Technology	1127
5.58.7	Yaskawa / Motoman	1128
5.58.8	Yaskawa Motoman	1128
5.59	Vecna Technologies	1129
5.59.1	Vecna Telemedicine	1133
5.60	Selected Military Robot Companies	1135
5.60.1	Selected Robot Companies	1159
	WINTERGREEN RESEARCH,	1189
	WinterGreen Research Research Methodology	1190
	Figure ES-1	23
	Agrobot Strawberry Picker	23
	Table ES-2	25
	Robots Poised To Change Economics	25
	Table ES-3	26
	Robots Bring A New Industrial Revolution	26
	Table ES-4	28
	Robot Market Driving Forces	28

Table ES-5	29
Robot Target Markets	29
Table ES-6	31
Robotic Trends	31
Table ES-7	32
Robotic Evolving Activities	32
Table ES-8	33
Market Forces for Modernization	33
Table ES-9	33
Robotics – State of the Art Advantages	33
Table ES-10	34
Robot Challenges	34
Figure ES-11	35
Robot Market Forecasts Dollars, Worldwide, 2014-2020	35
Figure ES-12	36
Robot Market Segments, Industrial, Warehouse Logistics, Cargo Unloading, Military, Medical, Surgical, Rehabilitation, Agricultural, Cleaning, Unmanned Aircraft, and other Forecasts, Dollars, Worldwide, 2014-2020	36
Table ES-13	37

Robotic Market Opportunity	37
Table ES-14	38
Robotic Market Challenges	38
Figure ES-15	40
JobNotion.com Open Source Community	40
Table 1-1	42
Aspects of Sector Modernization	42
Figure 1-2	46
Intuitive Surgical da Vinci Surgical System	46
Figure 1-3	47
Robotics Positioned To Meet The Increasing Demands For Food And Bioenergy	47
Source: John Deere.	47
Figure 1-4	48
Autonomous Orchard Vehicle	48
Figure 1-5	49
Automated Picker Machine	49
Figure 1-6	50
Transformational Robots	50

Figure 1-7	53
Differences in Global Demand for Electrification Developed vs. Underdeveloped Economies	53
Table 1-8	55
Critical Capabilities In Robotics Needed To Take Robotics To The Next Level	55
Figure 1-9	56
Global Demand for Productivity and Energy Efficiency Driving Robot Markets	56
Figure 1-10	57
ABB Developed and Emerging Market Robot Perspective	57
Figure 2-1	58
Strawberry Picker	58
Table 2-2	63
Robots Poised To Change Market Segment Economics	63
Table 2-3	64
Robots Bring A New Industrial Revolution	64
Table 2-4	67
Robotic Market Opportunity	67
Table 2-5	68
Robotic Market Challenges	68

Table 2-6	69
Robotic Technical Challenges	69
Table 2-7	71
Robot Market Driving Forces	71
Table 2-8	72
Robot Target Markets	72
Figure 2-9	74
Robot Market Segments, Industrial, Warehouse Logistics, Cargo Unloading, Military, Medical, Surgical, Rehabilitation, Agricultural, Cleaning, Unmanned Aircraft, and other Forecasts, Dollars, Worldwide, 2014-202074	
Figure 2-10	75
Robot Market Segments, Industrial, Warehouse Logistics, Cargo Unloading, Military, Medical, Surgical, Rehabilitation, Agricultural, Cleaning, Unmanned Aircraft, and other Forecasts, Dollars, Worldwide, 2014-202075	
Table 2-11	76
Robotic Trends	76
Figure 2-12	77
Multiple Small Intelligent Machines Replace Large Manned Tractors	77
	77



77

Source: efoodblogspost.com

77



78

Figure 2-13

80

JobNotion.com Open Source Community

80

Table 2-14

83

Significant Market Drivers For Industrial Robots

83

Figure 2-15	84
Manufacturing Robot Controllers	84
Figure 2-16	85
Kuka Positioning in Robotics and Systems	85
Figure 2-17	88
Industrial Robot Density	88
Figure 2-18	89
Market Potential for Industrial Robots	89
Figure 2-19	90
Articulated Robot Sales	90
Figure 2-20	91
Robot Density in Automotive and General Industry	91
Figure 2-21	92
Global Automotive Production	92
Figure 2-22	93
Robot Strategy: Increased Share In General Industry	93
Figure 2-23	94
Robotics Market Growing by 22,000 Units	94

Figure 2-24	95
Global Sales of Industrial Robots	95
Figure 2-25	96
Industrial Automation Market Opportunity	96
Table 2-26	97
Industrial Robot Market Shares, Dollars, Worldwide, 2013	97
Table 2-27	98
Industrial Robot Market Shares, Dollars, Worldwide, 2013	98
Table 2-28	99
Industrial Robot Market Forecasts, Worldwide, 2013	99
Table 2-29	101
Industrial Robot Market Forecasts, Units, Worldwide, 2014-2020	101
Figure 2-30	102
Robotics End User Trends	102
Figure 2-31	104
Services Robotic Broad Offerings	104
Table 2-32	106

Ship Container and Loading Dock Logistics Robot Benefits	106
Table 2-33	107
Logistics Robots Operational Effectiveness Of Warehouses And Distribution Centers Benefits	107
Table 2-34	112
Military Robotics Market Factors	112
Table 2-35	113
Military Robot Functions	113
Table 2-36	116
Military Robots Market Driving Forces	116
Figure 2-37	118
Military Ground Robot Market Shares, Dollars, Worldwide, 2013	118
Table 2-38	119
Military Ground Robot Market Shares, Dollars, Worldwide, 2013	119
Figure 2-39	122
Military Ground Robot Market Forecasts, Shipments, Dollars, Worldwide, 2013-2019	122
Table 2-40	123
Military Ground Robot Market Forecasts, Shipments, Dollars, Worldwide, 2013-2019	123

Table 2-41	124
Mini and Small Military Ground Robot Market Forecasts Units and Dollars, Worldwide, 2013-2019	124
Figure 2-42	125
Mid Size Military Ground Robot Market Forecasts Units and Dollars, Worldwide, 2013-2019	125
Table 2-43	126
Larger Military Ground Robot Market Forecasts Units and Dollars, Worldwide, 2013-2019	126
Table 2-44	128
UAS Features:	128
Figure 2-45	129
General Atomics Predator UAS	129
Table 2-46	131
U.S. Army's Predator Variant, the I-GNAT® ER/Sky Warrior® Alpha Features	131
Figure 2-47	132
General Atomics Predator B UAS	132



	132
Table 2-48	133
Unmanned Aerial Systems Functions	133
Table 2-49	134
Unmanned Aerial Systems Features	134
Table 2-50	135
Unmanned Aerial Systems Mission Tasks	135
Table 2-51	136
Unmanned Aerial Systems (UAS) Benefits	136

Figure 2-52	137
Unmanned Aerial Systems (UAS) Market Shares, Dollars, 2013	137
Table 2-53	138
Unmanned Aerial Systems (UAS) Market Shares, Dollars, Worldwide, 2013	138
Figure 2-54	140
Unmanned Aerial Systems (UAS), Market Forecasts, Dollars, Worldwide, 2014-2017	140
Table 2-55	143
Cleaning Robotics Market Driving Forces	143
Table 2-56	144
Consumer Home Cleaning Product Development Challenges	144
Figure 2-57	146
Cleaning Robot Market Shares, Dollars, Worldwide, 2013	146
Table 2-58	147
Cleaning Robot Market Shares, Dollars, Worldwide, 2013	147
Figure 2-59	149
Vacuum Cleaner, Pool Cleaner, and Floor Washing Robot Market Forecasts, Dollars, Worldwide, 2012-2018	149
Figure 2-60	150
Cleaning Robot Market Shipment Forecasts, Dollars, Worldwide, 2014-2018	150

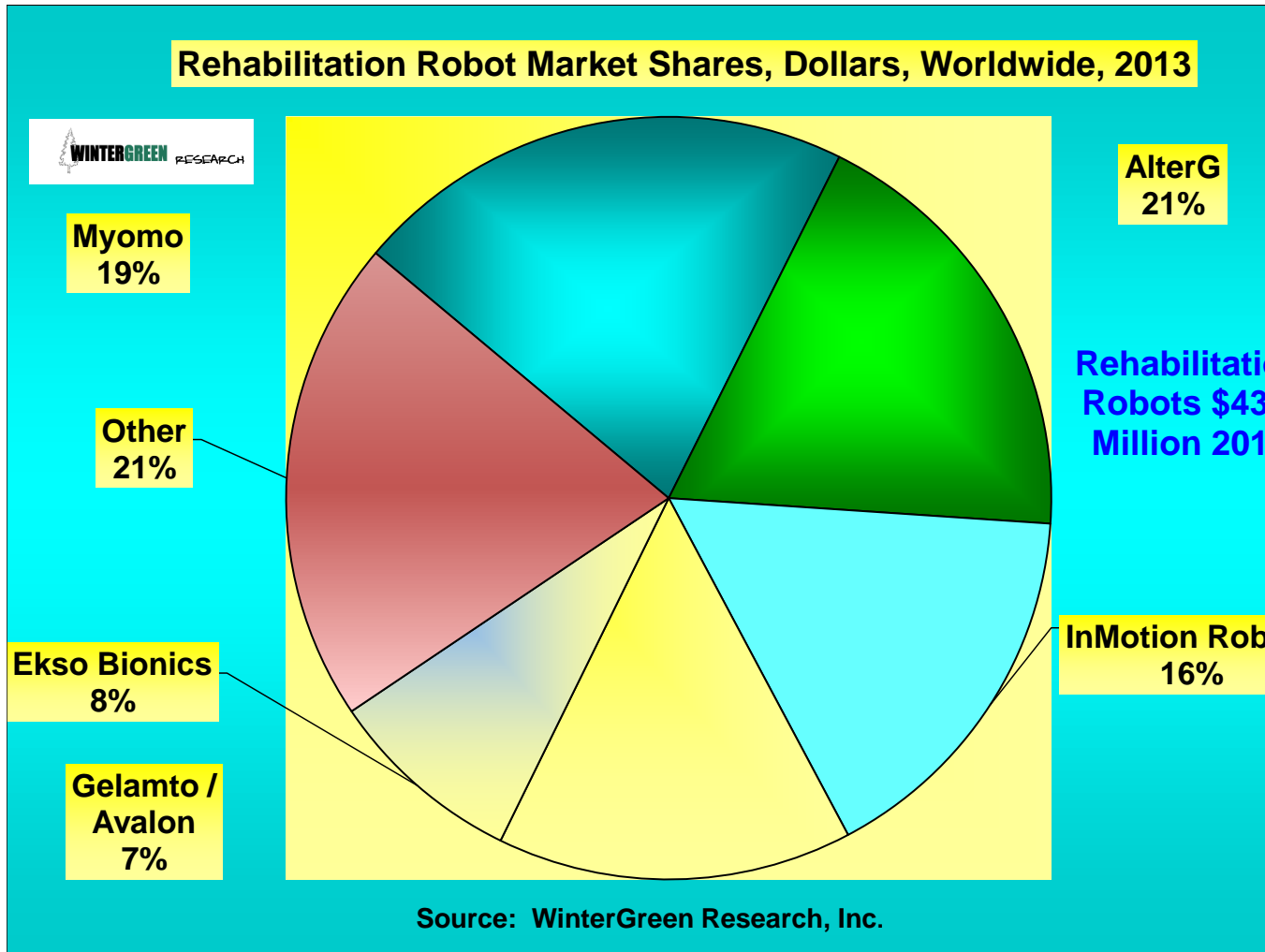
Table 2-61	151
Cleaning Robot Market Shipment Forecasts Units and Dollars, Worldwide, 2014-2018	151
Figure 2-62	157
Figure 2-63	159
Fraunhofer-Institut Genetic Robots	159
Figure 2-64	165
Figure 2-65	166
LifeWatch V, Android-Based Smartphone	166
Figure 2-66	168
Sotera Wireless ViSi Mobile	168
Figure 2-67	172
Medtronic Evera XT DR/VR	172
Figure 2-68	173
InTouch Health's Remote Presence Devices	173
Figure 2-69	174
JBT ATLAS (Automated Transport and Logistics Integration Systems) AGV	174
Figure 2-70	178
eCaring CareTracker	178

Table 2-71	181
Surgical Robotics Market Driving Forces	181
Table 2-72	182
Healthcare Robotics Enabling Technologies	182
Table 2-73	183
Robotic-Assisted Minimally Invasive Surgery Market Driving Forces	183
Table 2-74	184
Types Of Procedures Performed Using Robotic Surgical System	184
Figure 2-75	187
Medical Surgical Robots Market Shares, Shipments, Dollars, Worldwide 2012	187
Table 2-76	188
Medical Surgical Robots Market Shares, Dollars, Worldwide, 2012	188
Table 2-77	189
Medical Surgical Robots Units and Installed Base, Units, Worldwide, 2012	189
Figure 2-78	195
Intuitive Surgical da Vinci Surgical System Worldwide Procedures	195
Figure 2-79	196
Intuitive Surgical da Vinci Surgical System Worldwide Installed Base	196

Table 2-80	198
Hansen Medical Sensei® X Robotic Catheter System	198
Figure 2-81	199
Curexo Robodoc	199
Table 2-82	204
Robot Cars and Trucks Market Driving Forces	204
Table 2-83	205
Autonomous Vehicle Features Driving Adoption of Robotic Cars	205
Table 2-84	207
Leaders In Development of Robot Cars and Trucks	207
Figure 2-85	210
Robot Commercial Autonomous Car Market Shipments Forecasts Dollars, Worldwide, 2013-2019	210
Figure 2-86	211
Robot Commercial Autonomous Car Market Shipments Forecasts Dollars, Worldwide, 2013-2019	211
Table 2-87	212
Robot Car Shipments and Installed Base Compared to Electrical Vehicle Shipments and Installed Base Dollars and Units, Worldwide, 2013-2019	212
Table 2-88	214
Automotive Industry Market Factors	214

Table 2-89	215
Automotive Industry Limits On The Ability To Reduce Costs	215
Table 2-90	216
Electrical Vehicle Installed Base and Wireless Car Charging Shipments Dollars and Units, Worldwide, 2012-2019	216
Table 2-91	217
Electrical Vehicle Installed Base and Wireless Car Charging Shipments Dollars and Units, Worldwide, 2012-2019	217
Table 2-92	218
Electric Vehicle EV Market Forecasts, Units, Worldwide, 2013-2019	218
Table 2-93	219
Electrical Vehicle Shipments and Wireless Car Charging Market Penetration Dollars and Units, Worldwide, 2012-2019	219
Table 2-94	223
Rehabilitation Robot Target Markets	223
Table 2-95	224
Rehabilitation Robot Market Driving Forces	224
Table 2-96	226

Rehabilitation Robot Target Markets	226
Table 2-97	228
Health Care Conditions Treated With Rehabilitation Wearable Robotics	228
Table 2-98	230
Chattanooga Active-K Functions	230
Figure 2-99	231
DJO Chattanooga Active-K	231
Table 2-100	232
Rehabilitation Robot Medical Conditions Treated	232
Table 2-101	233
Rehabilitation Robot Medical Technology	233
Table 2-102	234
Health Care Conditions Treated With Rehabilitation Wearable Robotics	234
Table 2-103	235
Robotic Technologies Leverage Principles Of Neuroplasticity	235
Figure 2-104	236
Rehabilitation Robot Market Shares, Dollars, Worldwide, 2013	236



	236
Figure 2-105	238
Rehabilitation Robot Market Forecasts Dollars, Worldwide, 2014-2020	238
Table 2-106	239
Rehabilitation Robot Medical Conditions Treated	239

Table 2-107	240
Rehabilitation Robot Medical Technology	240
Table 2-108	241
Health Care Conditions Treated With Rehabilitation Wearable Robotics	241
Table 2-109	242
Robotic Technologies Leverage Principles Of Neuroplasticity	242
Table 2-110	243
Agriculture Robotic Activities	243
Table 2-111	244
Market Forces for Modernization	244
Table 2-112	244
Agricultural Robotics – State of the Art Advantages	244
Table 2-113	245
Robot Challenges	245
Table 2-114	246
Agricultural Robot Target Markets	246
Figure 2-115	248
Agricultural Robot Market Shares, Dollars, Worldwide, 2013	248

Robots Table of Contents and List of Tables and Figures

Table 2-116	249
Robot Market Shares, Dollars, Worldwide, 2013	249
Table 2-117	250
Lely Group Robotic Strengths	250
Table 2-118	251
Lely Group Robotic Challenges	251
Figure 2-119	253
Agrobot Strawberry Picker	253
Figure 2-120	254
John Deere Autonomous Tractors	254
Figure 2-121	255
Harvest Automation Shrub Robot	255
Table 2-122	256
Harvest Automation Shrub Robot Features:	256
Table 2-123	257
Harvest Automation Shrub Robot Functions:	257
Table 2-124	261
Robots for Ornamental Plant Handling Benefits	261

Figure 2-125	262
UC Davis Using Yamaha Helicopter Drones For Crop Dusting	262
Figure 2-126	264
Yahama Crop Duster	264
Figure 2-127	266
Distributed Robotics Garden	266
Figure 2-128	268
Modernized Agriculture Telegarden, As Installed At Ars Electronica	268
Figure 2-129	271
Agricultural Robot Market Forecasts Dollars, Worldwide, 2014-2020	271
Figure 2-130	272
Larger Agricultural and Planting Robot Market Forecasts Dollars, Worldwide, 2014-2020	272
Table 2-131	273
Robot Market Forecast, Shipments, Dollars, Worldwide, 2014-2020	273
Table 2-132	274
Robot Market Industry Segments, Cow Milking and Barn Systems, Strawberries and High Value Crops, Wheat, Rice, Corn Harvesting, Grape Pruning and Harvesting, Nursery Management, Golf Course and Lawn Mowing, Drone Crop Dusting Segments, Dollars, Worldwide, 2014-2020	274

Table 2-133	276
Robot Market Industry Segments, Cow Milking and Barn Systems, Strawberries and High Value Crops, Wheat, Rice, Corn Harvesting, Grape Pruning and Harvesting, Nursery Management, Golf Course and Lawn Mowing, Drone Crop Dusting Segments, Percent , Worldwide, 2014-2020	276
Table 2-134	277
Voluntary Cow Traffic Benefits	277
Table 2-135	278
Cow Traffic System Cubicles ROI Metrics	278
Table 2-136	279
Lely Example of Herd Size and Robots / Farm Worker	279
Table 2-137	281
Roles of Robots	281
Figure 2-138	282
Cost Structures and Roles of Robots	282
Table 2-139	285
Nuclear Response Robotic Functions	285
Table 2-140	286
Nuclear Response Robots Market Driving Forces	286
Figure 2-141	288

Nuclear Response Robot Market Shares, Dollars, Worldwide, 2012	288
Table 2-142	289
Nuclear Response Robot Market Shares, Dollars, Worldwide, 2012	289
Figure 2-143	293
Energid / Mitsubishi Nuclear Robot	293
Figure 2-144	295
Nuclear Response Robot Market Forecasts, Shipments, Dollars, Worldwide, 2013-2019	295
Table 2-145	296
Nuclear Response Robot Market Forecasts	296
Dollars, Worldwide, 2013-2019	296
Table 2-146	297
Nuclear Response Robot Market Forecasts	297
Units, Worldwide, 2013-2019	297
Table 2-147	299
Snake Robot Market Driving Forces	299
Table 2-148	300
Confined Spaces That Need Snake Shapes To Achieve Access	300
Figure 2-149	301

Robots Table of Contents and List of Tables and Figures

Snake Robots Market Shares, Dollars, Worldwide, 2012	301
Figure 2-150	302
Snake Robots Market Shares, Dollars, Worldwide, 2012	302
Figure 2-151	303
Snake Robot Market Forecasts, Dollars, Worldwide, 2013-2019	303
Table 2-152	304
Snake Robot Markets, Dollars, Worldwide, 2013-2019	304
Figure 2-153	305
Robotic Regional Market Segments, 2013	305
Table 2-154	306
Robot Regional Market Segments, 2013	306
Figure ES-1	360
Agrobot Strawberry Picker	360
Table ES-2	363
Robot Market Driving Forces	363
Figure 3-1	365
Robot Based Assembly	365

Figure 3-2	367
Automotive Production Complexity	367
Table 3-3	369
Global Industrial Robotics Market Segmentation	369
Figure 3-4	370
ABB FlexPicker	370
Figure 3-5	372
ABB IRB 120	372
Figure 3-6	373
ABB Industrial Automation	373
Table 3-7	374
ABB Addresses Major Trends In Industry Robotics	374
Figure 3-8	375
Kawasaki Robot Types	375
Figure 3-9	378
FANUC Pick-And-Place Robot	378
Figure 3-10	380
Fanoc Robotic Manufacturing Technology	380

Figure 3-11	381
Robotic Manufacturing	381
Figure 3-12	382
Fanuc Robot Factories	382
Figure 3-13	384
Yaskawa Motoman Robots	384
Figure 3-14	395
Kuka Quantec	395
Figure 3-15	396
Kuka Customer Production Focus	396
Figure 3-16	397
Kuka Automotive Stages of Implementation	397
Figure 3-17	398
Kuka US Auto Initiatives	398
Figure 3-18	399
KukaSize and Versatility Advantages of Quantec Industrial Robot	399
Figure 3-19	400
Kuka Product Strategy	400

Figure 3-20	401
Kuka Line of Industrial Robots	401
Table 3-21	402
Kuka Industrial Robot Innovations	402
Table 3-22	403
Kuka Competitive Advantage	403
Figure 3-23	404
Denso Wave Industrial Robot Categories	404
Figure 3-24	405
Stäubli 4-Axis And 6-Axis Robots	405
3.9 Logistics Services Robots	406
Figure 3-25	407
Logistics Services Robot Hydraulic End Effector	407
Figure 3-26	408
Hydraulic Power Units Deliver Controllable, Efficient Fluid Power	408
Figure 3-27	412
Motoman Robots Pick, Pack, and Palletize	412
Figure 3-28	413

Yaskawa Motoman Picking	413
Figure 3-29	415
Yaskawa Motoman Packaging	415
Figure 3-30	417
Yaskawa Motoman Palletizing	417
Figure 3-31	418
Motoman Partners in Logistics and Warehousing	418
Figure 3-32	425
Northrop Grumman Mini-ANDROS II	425
Figure 3-33	428
iRobot 510PackBot for EOD Technicians	428
Table 3-34	429
iRobot 510 PackBot for EOD Conventional Ordnance and SWAT Missions	429
Figure 3-35	430
iRobot® PackBot® 510 for Infantry Troops	430
Figure 3-36	431
iRobot® PackBot® 510 for Combat Engineers	431
Table 3-37	431

iRobot 510 PackBot for Combat Engineers Tasks	431
Figure 3-38	432
iRobot® 710 Warrior™	432
Table 3-39	433
iRobot® 710 Warrior™ Uses	433
Figure 3-40	434
iRobot® 110 FirstLook®	434
Figure 3-41	435
iRobot® 110 Small, Light And Throwable FirstLook® Uses	435
Figure 3-42	436
iRobot® SUGV	436
Figure 3-43	437
iRobot® SUGV Uses	437
Figure 3-44	438
iRobot® 1KA Seaglider™	438
Figure 3-45	439
iRobot® 1KA Seaglider® Uses	439
Figure 3-46	443

General Dynamics TAC-C Robot	443
Figure 3-47	444
Next-Generation General Dynamics Robots	444
Table 3-48	447
iRobot Roomba® 790 Specifications	447
Table 3-49	448
iRobot Roomba® 790 Vacuum Cleaning Robot Features	448
Figure 3-50	450
iRobot on Google	450
Figure 3-51	452
iRobot Use in Kitchen	452
Figure 3-52	453
iRobot Use in Living Room	453
Figure 3-53	454
Matsutek Vacuum Robot	454
Figure 3-54	455
Matsutek Vacuum Robot Product Line	455
Table 3-55	457

Matsutek Smart Multi-Function Vacuum Cleaner With Remote Control

457

TABLE 3-55

MATSUTEK SMART MULTI-FUNCTION VACUUM CLEANER WITH REMOTE CONTROL

Product ID: RV-14

Smart Multi-Function Vacuum Cleaner with remote control

1. Smart cleaning programming for maximum room coverage:"Random, Spiral, Along the wall, Z type."
2. RV-14 returns automatically to its docking station to recharge when power is exhausted or the cleaning program is executed.
3. Multiple cleaning programs of timer for every day of week.
4. RV-14 is capable of cleaning wood, linoleum and tile.
5. Built-in cliff avoidance sensors prevent RV-14 from falling down stairs.
6. Three running time period settings(short, medium, maximum) depending on room size.
7. Easy removing and cleaning dust bin will not smudge your hands.
8. Smart enough to get out of tight places with its touch-sensitive bumper.
9. Automatically to clean your room step by step.
10. Remote control lets you guide the unit in any direction to clean specific areas.

437

Table 3-55 (Continued)	458
Matsutek Smart Multi-Function Vacuum Cleaner With Remote Control	458
Figure 3-56	459
Matsutek Floor Cleaning Robot	459
Table 3-58	461
Yujin Robotic Vacuum Cleaner Features	461
Figure 3-59	462
Samsung VC-RM72VR Smart Tango Dual CPU Automatic Cleaner Super Slim Robot Vacuum	462
Figure 3-60	463
Samsung VC-RM96W Tango Robot Vacuum	463
Figure 3-61	465
Samsung Cleaning Robot Multiple Views	465
Figure 3-62	466
Samsung Cleaning Robot	466
Figure 3-63	467
Samsung Sensor Placement	467
Figure 3-64	469
LG Hom-Bot	469

Figure 3-65	471
LG Electronics Motor	471
Figure 3-66	472
LG Electronics Lithium Polymer Batteries	472
Figure 3-67	476
Robotic Surgical Images	476
Figure 3-68	477
Image Guided Surgical Research	477
Table 3-69	481
Hansen Medical Sensei® X Robotic Catheter System	481
Figure 3-70	482
Curexo Robodoc	482
Figure 3-71	486
Restoration Robotics Fusion of Robotics and Digital Imaging	486
Figure 3-72	489
Titan Medical Novel robotic platform for Single Port Access Surgery	489
Figure 3-73	490
Titan Medical Amadeus Composer Surgical System	490

Figure 3-74	491
Titan Robot	491
Figure 2-75	492
Titan Medical Novel robotic platform for Single Port Access Surgery	492
Figure 2-76	493
Titan Medical Amadeus Composer Surgical System	493
Table 3-77	494
Titan Robot Flexibility And Open Architecture Functions	494
Figure 3-78	499
GlobalMed Telemedicine Carts	499
Figure 3-79	500
GlobalMed Telemedicine Carts Mobile Medical Stations	500
Figure 3-80	501
GlobalMed Telemedicine Cart Mobile Medical Station	501
Figure 3-81	503
GlobalMed i8500 Teleaudiology Station	503
Figure 3-82	504
GlobalMed Telehealth Cameras	504

Figure 3-83	505
GlobalMed TotalExam™ HD Examination Camera	505
Figure 3-84	506
TotalExam™ Examination Camera	506
Figure 3-85	510
Bosch Health Buddy System	510
Table 3-86	511
Bosch Health Buddy System Components	511
Figure 3-87	512
Bosch Health Buddy Decision Support Dashboard and Heat Map	512
Table 3-88	513
Bosch Healthcare Telemedicine Solution	513
Table 3-89	515
Kuka Partnership with Siemens	515
Figure 3-90	516
Kuka Strategy for Medical Robots	516
Figure 3-91	517
Kuka Service Robotic Features	517

Figure 3-92	517
Kuka Robotic Production and Assembly Features	517
Figure 3-93	518
Metra Labs Mobile Robot	518
Figure 3-94	522
Aethon TUG Medical Logistics Robots	522
Figure 3-95	525
Unbounded Robotics UBR-1	525
Figure 3-96	529
Chattanooga OptiFlex® 3 Knee Continuous Passive Motion (CPM) Device	529
Table 3-97	537
Hocoma Products	537
Figure 3-98	538
Hocoma Automates Locomotion Therapy On A Treadmill	538
Table 3-99	539
Hocoma Rehabilitation Robot Systems	539
Figure 3-100	540
Hocoma Armeo Arm Robot Systems	540

Figure 3-101	541
Hocoma Lokomats Robot	541
Figure 3-102	544
Hocoma ArmeoSpring for Stroke Victims	544
Figure 3-103	545
Hocoma ArmeoSpring for Children	545
Figure 3-104	546
Hocoma Lokomat Lower Extremity Robot	546
Figure 3-105	549
Honda Walk assist	549
Figure 3-106	550
Honda Stride Management	550
Figure 3-107	552
Honda Walk Assist Device Specifications	552
Figure 3-108	554
Ekso Bionics Regional Presence	554
Figure 3-109	555
Ekso Bionics Gait Training	555

Figure 3-110	556
Ekso Bionics Gait Training Functions	556
Table 3-111	557
Ekso Gait Training Exoskeleton Functions	557
Table 3-112	558
Ekso Gait Training Exoskeleton Functions	558
Figure 3-113	559
Ekso Bionics Step Support System	559
Table 3-114	560
Ekso Bionics Operation Modes	560
Figure 3-115	561
Ekso Bionics Bionic Suit	561
Figure 3-116	563
Walking Assist Device from Honda and HAL Robot Suit From Cyberdyne.	563
Table 3-117	565
Wireless Car Charger Market Characteristics	565
Table 3-118	570
Leaders in Development of Robot Cars and Trucks	570

Figure 3-119	573
General Dynamics TAC-C Robot	573
Figure 3-120	574
Next-Generation General Dynamics Robots	574
Figure 3-121	578
Northrop Grumman Mini-ANDROS II	578
Figure 3-122	579
IBM MessageSight Ford	579
Figure 3-123	582
Ford Self Driving Car	582
Figure 3-124	584
Ford Robotic Auto Control System	584
Table 3-125	586
Toyota Production LS 2013 Model Self-Driving Tools Technology	586
Figure 3-127	589
Google Self Driving Car	589
Figure 3-128	590
Google Self Driving Car Moving	590

Figure 3-129	592
Google Driverless Car	592
Figure 3-130	594
Honda ASIMO	594
Figure 3-131	596
Vecna Bear™ Robot Designed To Locate, Lift And Rescue People	596
Table 3-132	600
Nursery Robot Benefits	600
Figure 3-133	605
Cows Grazing	605
Figure 3-134	607
European Union Seventh Framework Program cRops (Clever Robots for Crops) Focus On Harvesting High Value Crops	607
Figure 3-135	612
John Deere Autonomous Tractors	612
Figure 3-136	613
John Deere Autonomous Tractor Flexible Uses	613
Figure 3-137	614
John Deere Crop Spraying	614

Figure 3-138	615
Kuka Robots	615
Figure 3-139	615
Kuka Material Handling Robots	615
Figure 3-140	616
Kuka Industry Standard Robots Used in Agriculture	616
Figure 3-141	617
Kuka Welding Robots for Agriculture	617
Figure 3-142	618
Kuka Robots in the Food Handling Industry	618
Figure 3-143	619
Kuka Robots in the Food Processing Industry	619
Figure 3-144	621
Kuka Vitamin A Robot Handlers	621
Figure 3-145	624
Kuka Plasma Cutting Robot	624
Figure 3-146	625
Fanuc M-3iA Robots Sorting Boxes	625

Figure 3-147	626
FANUC Robodrill DiA5 Series	626
Figure 3-148	627
FANUC Welding Robots	627
Figure 3-149	627
FANUC Material Handling Robots	627
Figure 3-150	628
FANUC Plasma Cutting Robot	628
Figure 3-151	629
ABB Welding Robots	629
Figure 3-152	629
ABB Material Handling Robots	629
Figure 3-153	630
Yaskawa Plasma Cutting Robot	630
Figure 3-154	631
Yaskawa Robots Used in Agriculture	631
Figure 3-155	632
Yaskawa Industrial AC Drives 1/8 thru 1750 Horsepower	632

Figure 3-156	633
Yaskawa Specialty Pump Drives 3/4 thru 500 Horsepower	633
Figure 3-157	634
Motoman Robot Handling and Palletizing Bags of Livestock Feed	634
Table 3-158	635
Motoman Robot Handling and Palletizing Bags of Livestock Feed Project Challenges	635
Table 3-159	636
Motoman Agriculture Robotics Palletizing Bags Solution	636
Table 3-160	638
Motoman Grain Bin Dryer Fan Wheels Project Challenges	638
Table 3-161	639
Motoman Grain Bin Dryer Fan Wheels Robotics Solution	639
Figure 3-162	640
Motoman Irrigation Pipe	640
Table 3-163	641
Motoman Irrigation Pipe Project Challenges	641
Table 3-164	642
Motoman Irrigation Pipe	642


Robotics Solution	642
Figure 3-165	643
Motoman End-Of-Arm Tooling With Clamping Equipment	643
Table 3-166	645
Motoman Equipment Project Challenges	645
Table 3-167	646
Motoman Equipment Robotics Solution	646
Figure 3-168	647
Motoman Round Baler Pickup Frames for Equipment	647
Table 3-169	648
Motoman Round Baler Pickup Frames for Equipment Project Challenges	648
Table 3-170	649
Motoman Round Baler Pickup Frames for Equipment Robotics Solution	649
Figure 3-171	650
Motoman Skid Steer Loader Mount Plates	650
Table 3-172	651
Motoman Skid Steer Loader Mount Plates Project Challenges	651
Table 3-173	652

Motoman Skid Steer Loader Mount Plates Robotics Solution	652
Figure 3-174	653
Motoman Bags of Livestock Feed	653
Table 3-175	654
Motoman Bags of Livestock Feed Project Challenges	654
Table 3-176	655
Motoman Bags of Livestock Feed Robotics Solution	655
Figure 3-177	657
Harvest Automation Shrub Robot	657
Figure 3-178	658
Harvest Automation Shrub Robot In Garden	658
Figure 3-179	659
Harvest Automation Robot Provides Marketplace Sustainability	659
Table 3-180	660
Harvest Automation Shrub Robot Features:	660
Table 3-181	661
Harvest Automation Shrub Robot Functions:	661
Figure 3-182	662

Robotic Harvesting of Strawberries	662
Figure 3-183	664
Agrobot SW 6010	664
Figure 3-184	665
Agrobot AGB: Harvesting High Level System	665
Figure 3-185	667
Agrobot AG Vision	667
Figure 3-186	668
Blue River Technology Robot	669
Figure 3-187	669
Blue River Precision Lettuce Thinning Robot	670
Table 3-188	671
Blue River Technology Robot Functions	671
Figure 3-189	672
Blue River Precision Lettuce Thinning - 80/84" beds	672
Table 3-190	674
cRops Robotic Platform Functions	674
Table 3-191	675

cRops Robot System European Project Supporters	675
Figure 3-192	676
cRops Robot System	676
Figure 3-193	677
cRops Robot Target System	677
Figure 3-194	678
Jaybridge Robotics Driverless Tractor	678
Figure 3-195	681
Small Tractor Used For Manual Artichokes Harvesting	681
Figure 3-196	682
Robomow RL850 Automatic Lawn Mower	682
Figure 3-197	684
MIT Smart Gardener Robot	684
Figure 3-198	686
Carnegie Mellon Self-Guided Farm Equipment	686
Figure 3-199	687
Carnegie Mellon Self-Guided Equipment Running on Farm	687
Figure 3-200	690

Vision Robotics Snippy Robotic Vine Pruner	690
Figure 3-201	692
Herder Robotic Rover	692
Figure 3-202	695
Lely Automatic Milking	695
Figure 3-203	696
Astronaut Milking Robot	696
Figure 3-204	700
Lely Milking System Farm	700
Figure 3-205	700
Lely Cattle Feeding System Farm	701
Figure 3-206	701
Lely Automated Process for Managing Milking and Farm	702
Figure 3-207	702
Lely Correct Cattle Feeding Management	702
Figure 3-208	703
Lely Automated Process Cattle Feeding Management	703
Figure 3-209	703

Lely Multi-Barn Cattle Feeding Management	703
Figure 3-210	706
Lely Cattle Milking Management	706
3.89 Snake Robots	708
Figure 3-211	708
Snake Robots, Control of the Snake-Arm Robot	708
	708
Figure 3-212	716
Nose Following Snake Robots	716
Figure 2-213	717

OC Robotics Snake-Arm Simulator	717
Table 2-214	719
Confined Spaces	719
Table 4-1	721
Sensor Technology Functions	721
Table 4-2	721
Robot System Architecture	721
Table 4-3	722
Proprietary Sensor Technology	722
Table 4-4	723
System Design & Architecture	723
Table 4-5	729
Tight Scientific Collaboration Between Different Disciplines	729
Figure 4-6	730
IEEE Robots	730
Figure 4-7	731
IEEE Orchard Robots	731
Figure 4-8	732

IEEE Automated Robot	732
Figure ES-1	771
Agrobot Strawberry Picker	771
Table ES-2	774
Robot Market Driving Forces	774
Table 5-1	785
ABB Product Launches	785
Table 5-2	786
ABB Global Lab Target Technologies	786
Table 5-3	788
ABB's Global Lab Automation Target Solutions	788
Table 5-4	789
ABB Active Current Research Areas	789
Table 5-5	793
Accuray Strategy	793
Table 5-6	794
Accuray Key Elements Of Strategy	794
Figure 5-7	808

Agrobot Strawberry Picker	808
Figure 5-8	809
Agrobot Strawberry Picker	809
Figure 5-9	810
Agrobot Robot for Agriculture	810
Table 5-10	811
Agrobot Innovation and Technology for Agribusiness	811
Figure 5-11	812
Agrobot Innovation and Technology for Agribusiness	812
Table 5-12	813
Agrobot SW6010 Support	813
Figure 5-13	814
Allen Vanguard Threat Intelligence	814
Table 5-14	815
Allen-Vanguard R&D Team Mandate:	815
Table 5-15	816
Allen-Vanguard Scientific And Engineering Topics Researched and Developed	816
Table 5-16	817

Allen-Vanguard R&D Fundamental Research	817
Table 5-17	818
Allen-Vanguard R&D Engineers And Scientists Comprehensive Research	818
Table 5-18	821
BAE Systems Standards	821
Figure 5-19	823
BAE Systems Revenue in Defense Market	823
5.8 Blue Belt Technologies.	825
5.9 Blue River Technology	826
Table 5-20	854
ECA Robotics Range Of Products	854
Table 5-21	855
Elbit Systems Activities:	855
Table 5-22	858
Elbit Systems Activities:	858
Figure 5-23	862
Fanuc Global Network	862
Figure 5-24	868

Fanuc's Organization	868
Figure 5-25	871
Fanuc Revenue	871
Figure 5-26	872
Fanuc Revenue	872
Table 5-27	874
Factors Impacting Ford Profitability Of Business	874
Figure 5-28	901
Boston Dynamic LS3	901
Figure 5-29	903
Boston Dynamic CHEETAH	903
Figure 5-30	904
Boston Dynamic Atlas	904
Figure 5-31	906
Boston Dynamic BigDog	906
Figure 5-32	908
Boston Dynamics LittleDog -	908
Table 5-33	910

Google Autonomous Vehicles Technology	910
Table 5-34	926
Hansen Medical Robotic-Assisted Minimally Invasive Surgery Principal Competitive Factors	926
Table 5-35	934
Harvard Robobee Project Characteristics	934
Figure 5-36	936
Harvard Robobee Kilobot Robot Group	936
Table 5-37	940
Harvest Automation Robot Navigation	940
Table 5-38	941
Harvest Automation Robot Sensor Network Functions	941
Table 5-39	942
GM Market Positioning	942
Table 5-39	955
Intuitive Surgical Strategy To Improve Candidate Surgical Procedures	955
Table 5-40	972
iRobot Strategy Key elements	972
Table 5-41	973

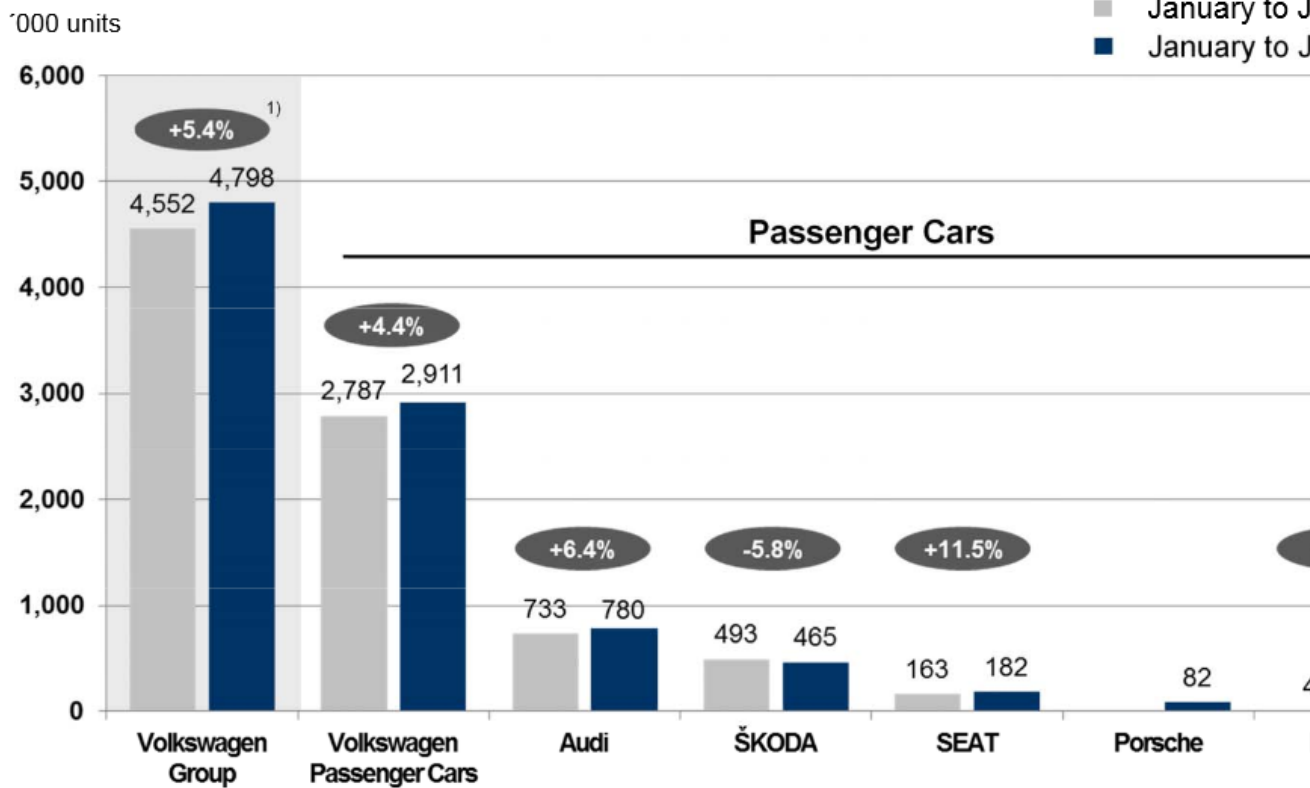
iRobot Strategy Key Common Platforms and Software elements	973
Figure 5-42	985
Kuka Vision for Expansion of Robotic Markets	985
Figure 5-43	989
Kuka Regional (10) and Segment (7) Focus	989
Figure 5-44	991
Kuka Positioning with Smart Tools	991
Figure 5-45	997
Lockheed Martin Segment Positioning	997
Table 5-46	998
Lockheed Martin's Operating Units	998
Figure 5-47	1000
Lockheed Martin Aeronautics Segment Positioning	1000
Figure 5-48	1001
Lockheed Martin Aeronautics Segment Portfolio	1001
Figure 5-49	1002
Lockheed Martin Aeronautics C130 Worldwide Airlift	1002
Figure 5-50	1003

Lockheed Martin Aeronautics Falcon Fighter	1003
Figure 5-51	1004
Lockheed Martin Electronic Systems Portfolio	1004
Table 5-52	1011
MAKO Robotic Surgery Benefits	1011
Table 5-53	1018
Medrobotics Cardiac Surgery Improvements	1018
Table 5-54	1019
Medrobotics Snake Robot Technologies For Use In A Wide Range Of Surgical And Interventional Applications	1019
Table 5-55	1020
Medrobotics Snake Robot Technologies Specialist Areas Served	1020
Table 5-56	1022
Mesa Robotics Technical Experience	1022
Table 5-57	1029
Northrop Grumman Partner Of Choice	1029
Figure 5-58	1032
Northrop Grumman Systems Segments	1032
Figure 5-59	1033

Northrop Grumman Portfolio	1033
Table 5-60	1059
QinetiQ Vision	1059
Figure 5-61	1064
QinetiQ Dragon Runner Urban Operations Rugged Ultra-Compact, Lightweight And Portable Reconnaissance Robot	1064
Table 5-62	1066
QinetiQ Customer Base	1066
Figure 5-63	1069
Re ² Core Technologies	1069
Figure 5-64	1070
Re ² Unmanned Ground Vehicles	1070
Figure 5-65	1071
Re ² Forerunner Key Features	1071
Figure 5-66	1073
Re2 Open Architecture for Robots	1073
Figure 5-67	1083
Shibuya Kogyo Robotic System For Leaflet & Spoon Placement	1083
Figure 5-68	1084

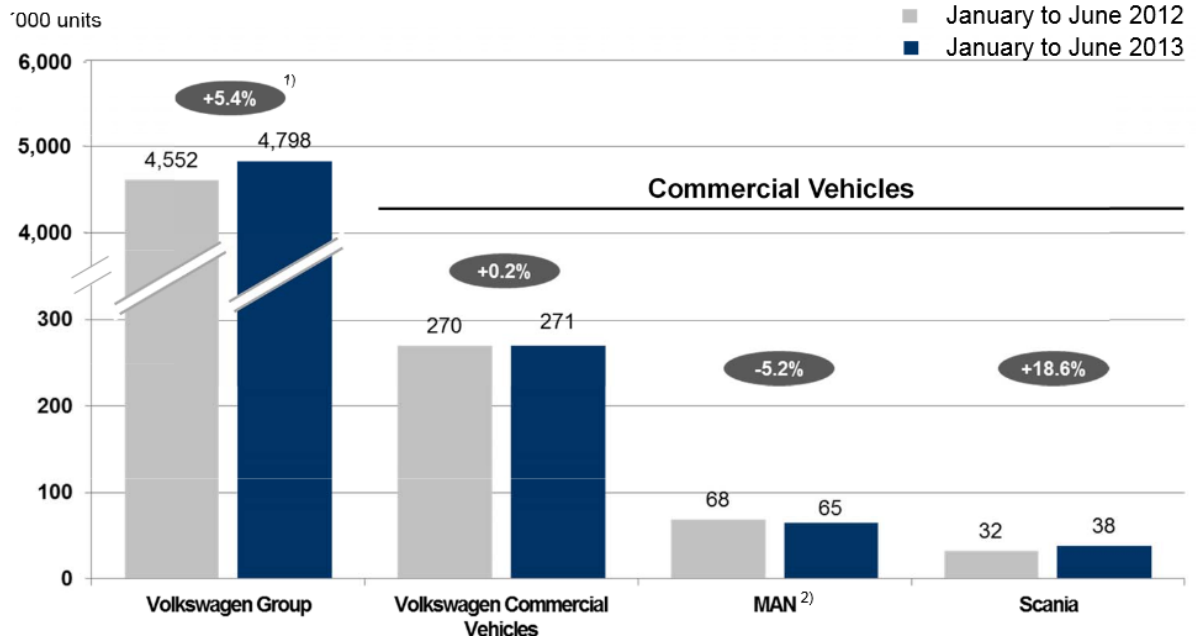
Shibuya Kogyo Robotic Collating System	1084
Figure 5-69	1085
Shibuya Kogyo Automated Aseptic Environmental Monitoring System	1085
5.49 Telerob	1088
5.50 Thales Group	1089
Table 5-69	1092
Thales Key Technology Domains	1092
Figure 5-70	1094
Thales Measurable Environmental Targets	1094
Figure 5-71	1098
Thales Group Ground Master 400	1098
Table 5-72	1099
Thales Group GROUND Master 400 Key Features:	1099
Table 5-73	1100
Thales Group Ground Smarter 1000 Key Features:	1100
Figure 5-74	1102
Thales Critical Decision Chain	1102
Figure 5-75	1104

Toyota Qi Wireless Charging	1104
Table 5-76	1107
Toyota / Lexus Advanced Active Safety Research Vehicle Features	1107
Figure 5-77	1110
Volkswagen Shipments in Comparison to World Car Shipments	1110



1110

(January to June 2013 vs. 2012)



	1111
Figure 5-78	1112
Volkswagon Brands	1112
Figure 5-79	1120
WiTricity Technology	1120
Figure 5-80	1121
UC Davis Using Yamaha Helicopter Drones For Crop Dusting	1121
Figure 5-81	1122
Yamaha Crop Dusting Initiatives	1122

Figure 5-82	1126
YASKAWA Electric Group Businesses	1126
Figure 5-83	1130
Vecna Hospital Delivery Bot	1130
Figure 5-84	1131
Vecna Robotics: HG2	1131
Table 5-85	1133
Vecna Technologies hydraulic end effector Specifications	1133
Figure 5-86	1134
Vecna Telemedicine	1134

