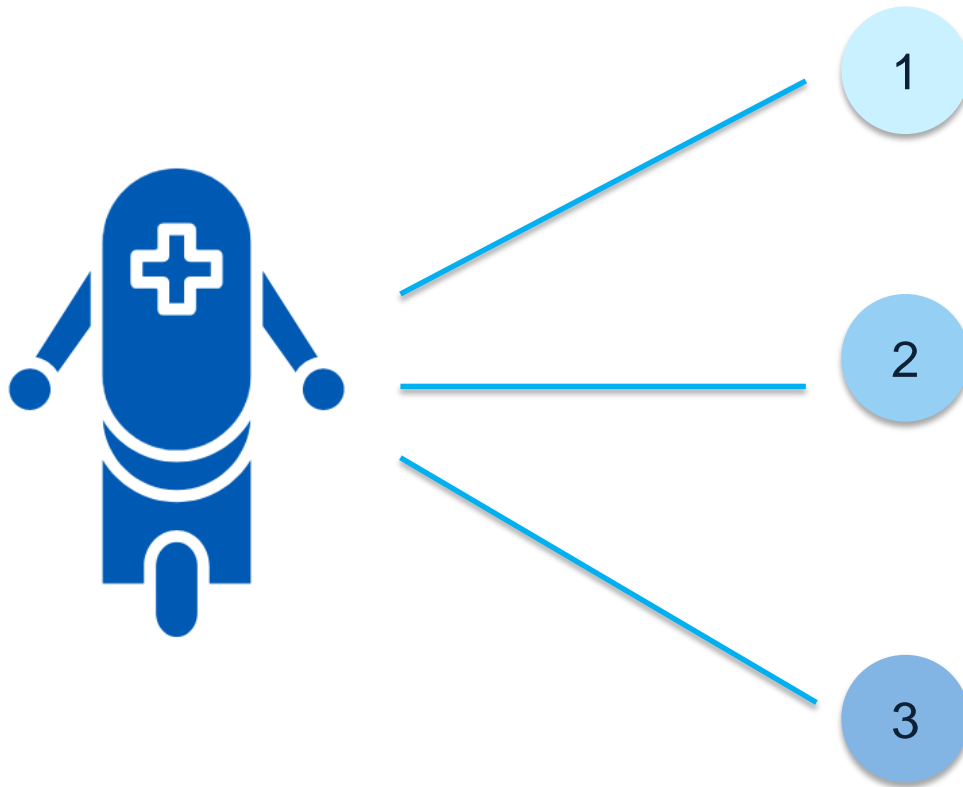


ROBOTICS IN HEALTHCARE

Key Players and Opportunities

Overview of robotics ecosystem in healthcare and wellbeing



Medical Robots

- Surgical robots
- Diagnostic systems

Healthcare Service Robots

- Medication delivery and dispensing
- Cleaning and disinfecting
- Telepresence and remote monitoring
- Autonomous vehicles/auxiliary robots (including food, specimen and laundry transportation)

Care Robots

- Companion robots/ personal assistants
- Assistive robots (includes elderly or immobile patient assistance and carriers, rehabilitation robots)
- Prosthetics and exoskeletons

Global robotics landscape in healthcare and wellbeing: Market Potential Assessment Summary

| Healthcare Robotics | | Technology Readiness | Breadth of Applications | Current Adoption | Growth Potential |
|------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------------------|--------------------------------------------|
| Medical Robots | Surgical Robots | | | | |
| | Diagnostics Robots | | | | |
| Healthcare Service Robots | Medication Delivery and Dispensing | | | | |
| | Cleaning and Disinfecting | | | | |
| | Telepresence and Remote Monitoring | | | | |
| | Autonomous Vehicles/ Auxiliary Robots | | | | |
| Care Robots | Companion Robots/ Personal Assistants | | | | |
| | Assistive Robots | | | | |
| Prosthetics and Exoskeletons | | | | | |
| LEGEND | | Predominantly R&D and prototype phase Several Commercial Products Technology Development | Low, Specific High, Multiple Breadth of Applications | Low, Pilots High, Commercial Current Adoption | Low High Growth Potential |

Shortlisted company profiles

From a long list of global companies, the focus of the shortlisted companies is on Healthcare Service Robotics, as well as more fragmented markets such as assistive robots, diagnosis, prosthetics and exoskeletons, and companion robots. In addition, these companies have been filtered by market potential and novel technologies.

| Company | Geography (HQ) | Application Area | Technology Readiness Level (R&D, Prototype, Commercial) | Market Potential (Market Size / Growth Potential / Evolving Markets) | Applications beyond primary vertical or current use case | Novel Technologies (Technology Gaps / Underserved Needs) |
|----------------------------|----------------|---------------------------------------------------|------------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------|----------------------------------------------------------------|
| Ava Robotics Inc. | USA | Telepresence and Remote Monitoring | Commercial | High | Yes | Yes |
| Bionik Laboratories | Canada | Assistive Robots (Rehabilitation) | Commercial & R&D | High | No | Yes |
| BioXtreme | Israel | Assistive Robots (Rehabilitation) | Prototype | High | No | Yes |
| Brain Navi | Taiwan | Diagnostic | Prototype | High | No | Yes |
| Diligent Robotics | USA | Autonomous Vehicles/Auxiliary robots | Commercial | High | Yes | Yes |
| Ekso Bionics | USA | Prosthetics and Exoskeletons | Commercial | High | No | Yes |
| Focal Meditech | Netherlands | Assistive Robots (Social and Therapeutic) | Commercial | High | Yes | Yes |
| GoBe (Blue Ocean Robotics) | Denmark | Telepresence and Remote Monitoring | Commercial | High | Yes | Yes |
| Hanson Robotics | Hong Kong | Companion Robots/Personal Assistants | Commercial, Prototype, R&D | High | Yes | Yes |
| InTouch Health | USA | Telepresence and Remote Monitoring | Commercial | High | Yes | Yes |
| Intuition Robotics | Israel | Companion Robots/Personal Assistants | Commercial | High | Yes | Yes |
| Lifeline Robotics | Denmark | Diagnostic | Prototype | High | No | Yes |
| Mobius Bionics | USA | Prosthetics and Exoskeletons | Commercial | High | No | Yes |
| Omnicell | USA | Medication Delivery & Dispensing | Commercial | High | No | Yes |
| PTR (Blue Ocean Robotics) | Denmark | Assistive Robots (Transfer and Rehabilitation) | Commercial | High | No | Yes |
| ReWalk Robotics | USA | Prosthetics and Exoskeletons | Commercial | High | No | Yes |
| Rudger's University | USA | Diagnostic | Prototype | High | No | Yes |
| UVD (Blue Ocean Robotics) | Denmark | Cleaning & Disinfecting | Commercial | High | Yes | Yes |
| Xenex | USA | Cleaning & Disinfecting | Commercial | High | No | Yes |
| Zora Robotics | Belgium | Autonomous Vehicles/Auxiliary robots | Commercial | High | Yes | Yes |

Global robotics landscape in healthcare and wellbeing:

1. Medical Robots

1.1 Global Surgical Robots Market Overview

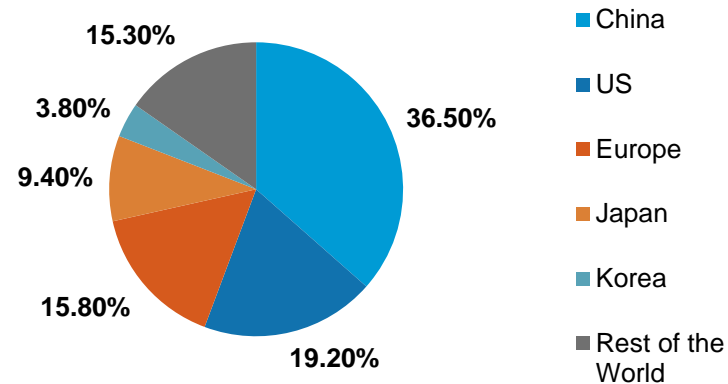


**>1.2 Million Procedures
~1500 Surgical Systems Placements
with an Installed Base of ~6000 hospitals**

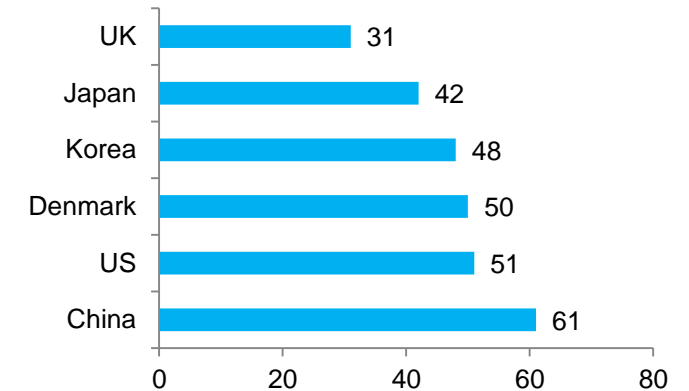
Top Market Participants

- Auris Health, Inc.
 - Accuray Incorporated
 - Brainlab
 - CMR Surgical Limited
 - Corindus Vascular Robotics, Inc.
 - Intuitive Surgical, Inc.
 - Medtronic
 - Medrobotics Corporation
 - Zimmer Biomet Robotics
 - Neocis, Inc.
- Renishaw
 - Riverfield Co., Ltd.
 - Stryker
 - Smith & Nephew plc
 - Stereotaxis, Inc.
 - Synaptive Medical, Inc.
 - Think Surgical, Inc.
 - Titan Medical Inc.
 - TransEnterix, Inc.
 - Virtual Incision Corporation

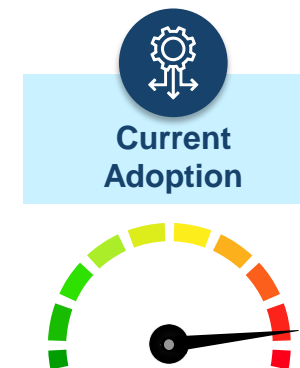
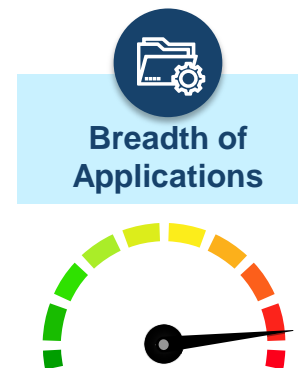
Top Patent Filings by Region, 2015-2020*



Average Patent Filing Time in Months, 2015-2020



Opportunity Assessment



*Note: Data up to date as of H1 2020

Global robotics landscape in healthcare and wellbeing:

1. Medical Robots

1.2 Global Diagnostic Robots Market Overview

Market Drivers

- Demand for minimally invasive procedures for diagnosis (e.g. biopsy) and to obtain targeted area samples with precision and less risk of infection due to less invasion.
- COVID-19 has accelerated the adoption with increasing demand for diagnostic tests.
- Scientific and technological advancements in AI/ machine learning etc.



- High establishment costs
- Fewer trained professionals with capabilities to administer the tests
- Lower/lack of reimbursement



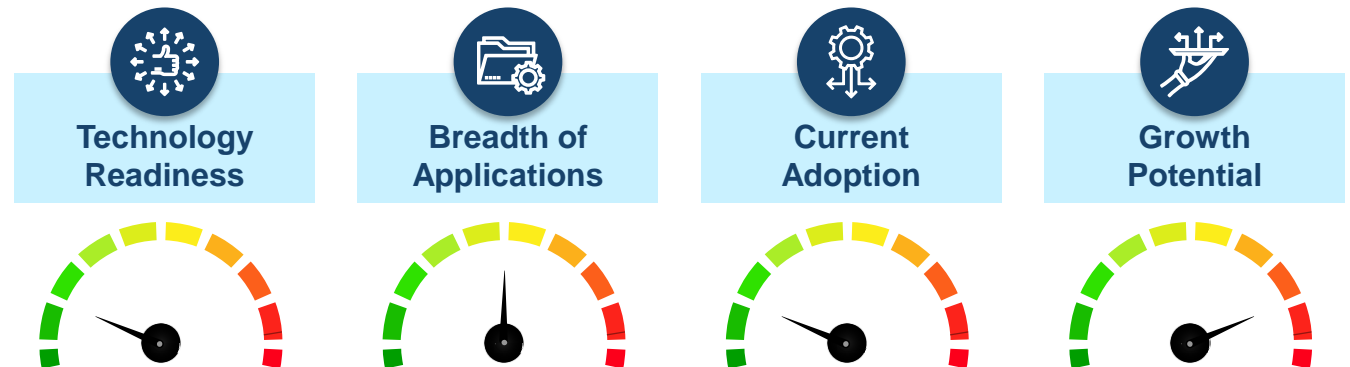
Market Restraints

Top Market Participants



- Biobot Surgical
- Brain Navi
- Lifeline Robotics
- Interventional Systems (iSYS Medizintechnik GmbH)
- Rudger's University
- Ubtech

Opportunity Assessment



Lifeline Robotics

Overview



Headquarters: Odense, Denmark

Year Founded: 2020

Funding: 2 million DKK (\$290,000) in funding from Vaekstfonden, which is the Danish state's investment fund.

Investors: Lifeline Robotics is a spin-out of the Maersk Mc-Kinney Moller Institute at the University of Southern Denmark (SDU). The company is owned jointly between the university, Norrsken Foundation, and REInvest Robotics.

No. of employees: 11-50

Value proposition



The first prototype for automated throat swab testing robot- Careebo LLR S1, was built in 4 weeks in May 2020 in partnership with SDU & the University Hospital in Odense. The company is expected to launch the product commercially and is accepting pre-booking from hospitals.

Technology Readiness Level

R&D

Prototype

Commercial

Healthcare (Hospitals, Public Health Systems, Labs)



The process of the automatic swab sample begins with scanning of patient ID-card, following which the robot prepares a sample kit, consisting of a container with a printed ID-label. Using an artificial intelligence based computer vision, a throat swab is performed and the sample is collected and secured for analysis. The process takes around 7 minutes in total, and the swab itself 25 seconds.

Existing Partnership Types



REInvest Robotics
Universal Robotics
Norrsken Foundation

Partnership Alignment

Low

High



Brain Navi Biotechnology Ltd.

Overview



Headquarters: Zhubei City, Taiwan
Year Founded: 2015
Funding: Undisclosed seed funding
Investors: Sunsino Ventures Group
No. of employees: 11-50

Target Market



Healthcare (Hospitals, Public Health Systems, Labs)

The Brain Navi Nasal Swab Robot enables hospitals to reduce staff-patient contact with highly infectious diseases at the point of testing by autonomously navigating and collecting patient's samples. The robot automatically recognizes the patient's facial structure and the precise nostrils location to autonomously take the samples without the need of medical staff.

Value proposition



NaoTrac, autonomous surgical navigation robot with machine vision specially designed for cranial neurosurgery was developed and has successfully performed 15 human trial cases at the Hualien Tzu-Chi Medical Center in 2018.

Technology Readiness Level

R&D

Prototype

Commercial

Existing Partnership Types



Partnership with Silicon Valley prototype development company Triple Ring Technologies to develop prototypes. Hospitals.

Partnership Alignment

Low

High



Global robotics landscape in healthcare and wellbeing:

2. Healthcare Service Robots

2.1 Medication Delivery and Dispensing Robots Market Overview

Market Drivers

- Increasing automation of pharmacies
- Increasing interest in medication adherence management especially as part of follow-up care



- Adoption is mainly on a pilot program basis and mainstream/ direct to patient uptake is still to take off

Market Restraints

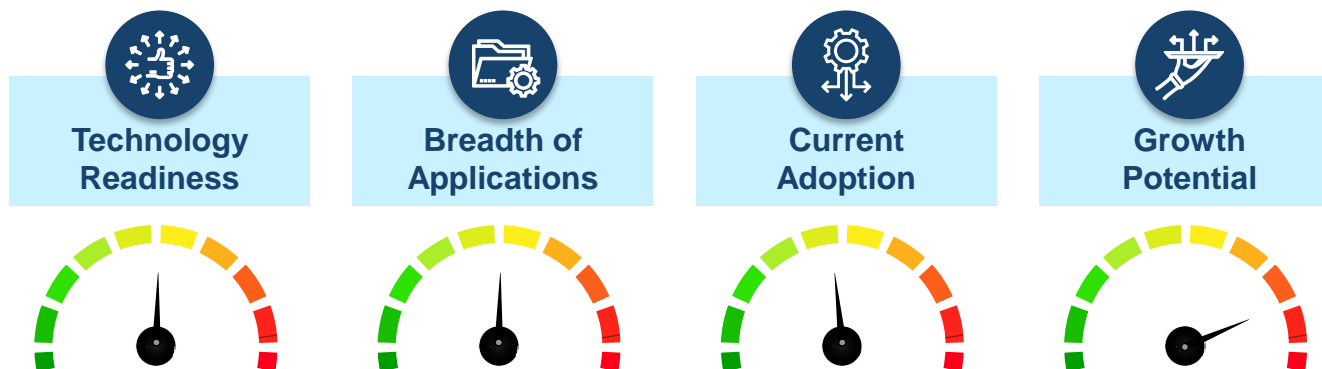


Top Market Participants



- Omnicell
- Pillo Health
- Capsa Healthcare
- Catalia Health
- Pria by Black+Decker

Opportunity Assessment



*Note: Data up to date as of H1 2020

Global robotics landscape in healthcare and wellbeing:

2. Healthcare Service Robots

2.2 Cleaning and Disinfecting Robots Market Overview

Market Drivers

- Market driven by regional and regulatory policies on reducing HAIs
- Maintaining hygiene protocols and standards especially as it has a direct impact on hospital accreditation
- Reducing manual labour, improving efficiency and cost savings for cleaning and disinfection.



- No significant market restraints as cleaning robots are a proven industry application.
- Initial adoption may be driven by large-medium hospitals as easier to justify the costs



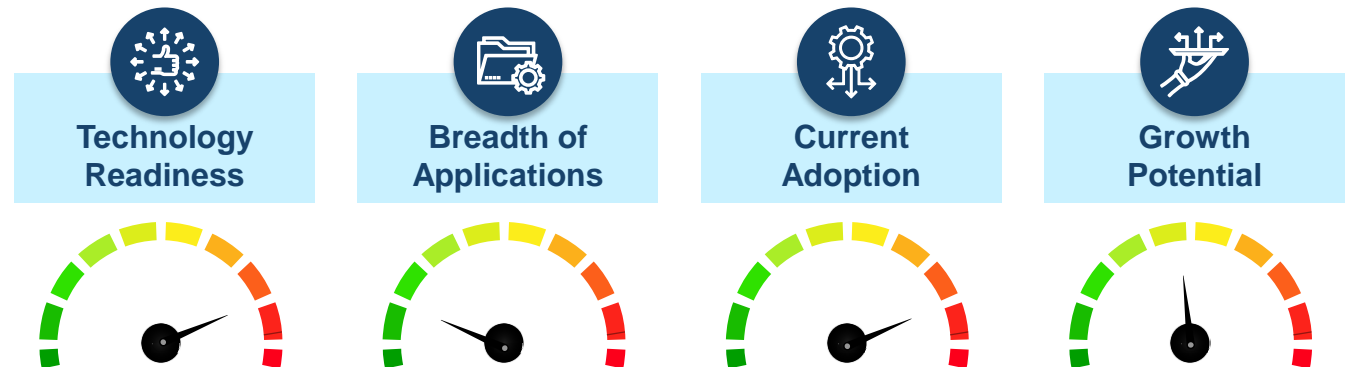
Market Restraints

Top Market Participants



- Blue Ocean Robotics
- Xenex Disinfectant Systems
- Finsen Technologies (Thor UV-C)
- Skytron (Infection Prevention Technologies)
- Tru-d Smartuvc
- Steris Healthcare
- Mediland Enterprise Corporation
- Tmirob Technology
- Fuzhou Rockchip Electronics Co. Ltd
- Engmotion
- Bridgeport Magnetics

Opportunity Assessment



*Note: Data up to date as of H1 2020

Global robotics landscape in healthcare and wellbeing:

2. Healthcare Service Robots

2.3 Telepresence and Remote Monitoring Robots Market Overview

Market Drivers

- Demand for bedside assistance, follow up and monitoring
- Gaining acceptance of video conferencing with healthcare professionals
- Support in assisted living and rehabilitation centres



- Technical complexities leading to operational issues



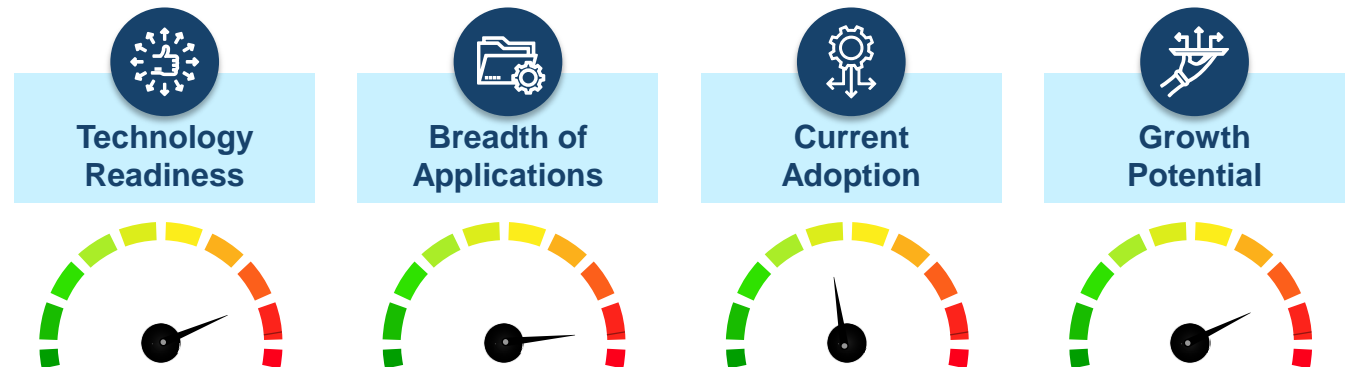
Market Restraints

Top Market Participants



- Ava Robotics Inc.
- Double Robotics Inc.
- AMY Robotics
- GoBe Robotics
- Inbot Technology Ltd
- InTouch Technologies Inc.
- VGo Communications Inc.
- Wicron Company
- Endurance Robots

Opportunity Assessment



Key players

Telepresence and Remote Monitoring

Ava Robotics Inc.

Overview



Headquarters: Massachusetts, USA

Year Founded: 2016

Funding: \$2.9M raised in seed funding, from Innospark Ventures

No. of employees: 11-50

Value proposition



The company offers end-to-end support in telepresence including pre-deployment consulting, implementation, operations and support, professional services etc.

Technology Readiness Level

R&D

Prototype

Commercial

Target Market



Healthcare (Hospitals and Long term care facilities)

Ava is a mobile intelligent robot that offers HD videoconferencing with up to 1080p30 video resolution along with full-fidelity audio as well as intelligent, autonomous navigation.

Ava comes equipped with full Cisco Webex video conferencing integration and advanced camera views suitable for remote visits and telemedicine support in healthcare facilities.

Existing Partnership Types



Hospitals

Cisco for Webex integration

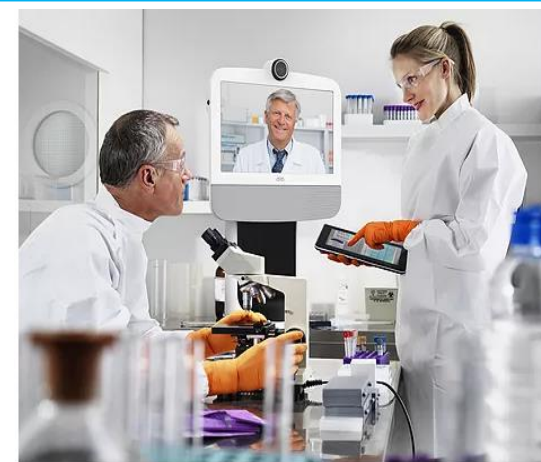
Ability to integrate with any third party video conferencing solutions such as Zoom

MIT's Computer Science and Artificial Intelligence Lab partnered with Ava Robotics to develop a robotic system to disinfect the Greater Boston Food Bank.

Partnership Alignment

Low

High



Global robotics landscape in healthcare and wellbeing:

2. Healthcare Service Robots

2.4 Autonomous Vehicles/ Auxiliary Robots Market Overview

Market Drivers

- Autonomous vehicles/ auxiliary robots have several proven use cases and industry applications that can be adapted to hospital settings
- Manage surge capacity during peak demand and improves the overall efficiency of logistics.



- Initial adoption may be driven by large-medium hospitals as easier to justify the costs
- Several projects in this space are pilot programs for automatic collection of lab samples etc. especially with the impact of COVID 19

Market Restraints

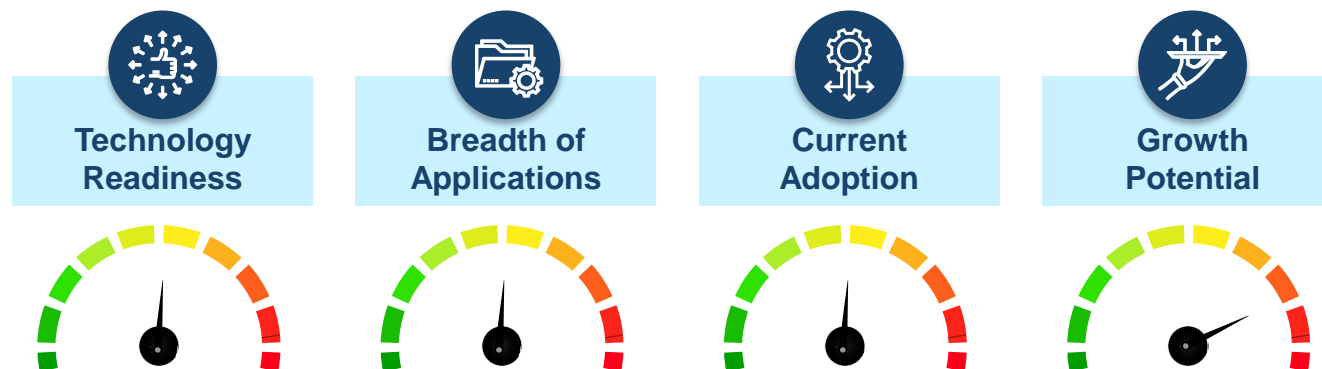


Top Market Participants



- Diligent Robotics
- Aethon TUG
- ZoraBots
- Panasonic
- Gibotech
- Swisslog Healthcare
- Vecna Technologies
- Savioke
- Nuro

Opportunity Assessment



Key players

Autonomous Vehicles/Auxiliary robots

Diligent Robotics - Moxi

Overview



Headquarters: USA - Austin, TX

Year Founded: 2014

Funding: \$15.8M

Investors: 13 Investors, including DNX Ventures, True Ventures, Ubiquity Ventures, Next Coast Ventures, E14 Fund, Promus Ventures, Grit Ventures

No. of employees: 32

Value proposition



Diligent Robotics is a female-founded A.I. company creating robot assistants that helps clinical staff with routine, non-patient-facing tasks so they have more time for patient care. Moxi has been successfully deployed in several US hospitals and focuses on fetch and deliver tasks for frontline clinicians.

Technology Readiness Level

R&D

Prototype

Commercial

Target Market



Healthcare (Hospitals)

Moxi helps hospitals run 24/7 by assisting clinical staff with non-patient-facing tasks such as:

- Gathering patient supplies
- Delivering lab samples
- Fetching items from central supply
- Distributing PPE
- Delivering medications

Existing Partnership Types



Hospitals

Partnership Alignment

Low

High



Key players

Autonomous Vehicles/Auxiliary robots

Zora Robotics

Overview



Headquarters: Belgium

Year Founded: 2011

Funding: €5M - Bart Versluys (angel, venture capital)

No. of employees: 11

Value proposition



ZoraBots specialises in new robotics software that is able to give life to humanoid robots like Nao and Pepper. It also creates its own humanoid robots. ZoraBots Operating System enables hardware and software to talk to and understand each other – it forms a bridge between the universal robot platform and the platform specific implementation for each robot.

Technology Readiness Level

R&D

Prototype

Commercial

Target Market



Hospitality, Retail, Industrial, Education, Home, Elderly Care, Healthcare
Healthcare applications include:

- Entertainment for patients, children or elders, during their hospital stay
- Personalised treatment or surgery explanations
- Visit and check in on patients
- Reduce loneliness (elderly)
- Reduce cognitive decline (elderly)
- Work on patients memory (elderly)
- Anti-epidemic applications (Mask Identification, temperature Measurement, Policy Promotion, Alerts & Video, Disinfection spraying patrols, Virus prevention patrol)

Existing Partnership Types

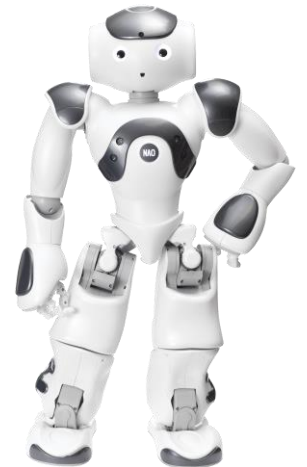


- SoftBank Robotics
- Boston Robotics
- Rethink Robotics
- paragon semvox (AI language processing)

Partnership Alignment

Low

High



Global robotics landscape in healthcare and wellbeing:

3. Care Robots

3.1 Companion Robots/ Personal Assistants Robots Market Overview

Market Drivers

- Large population of chronically ill and disabled population that are also socially isolated
- Need for personalised care and ensuring patient engagement to therapy, medication adherence etc.
- New use cases such as companions for autistic children, rehab for substance abuse etc.



- Cost of the robots may not make it easier for the elderly population to adopt it (unless through co-living/assisted living facilities)



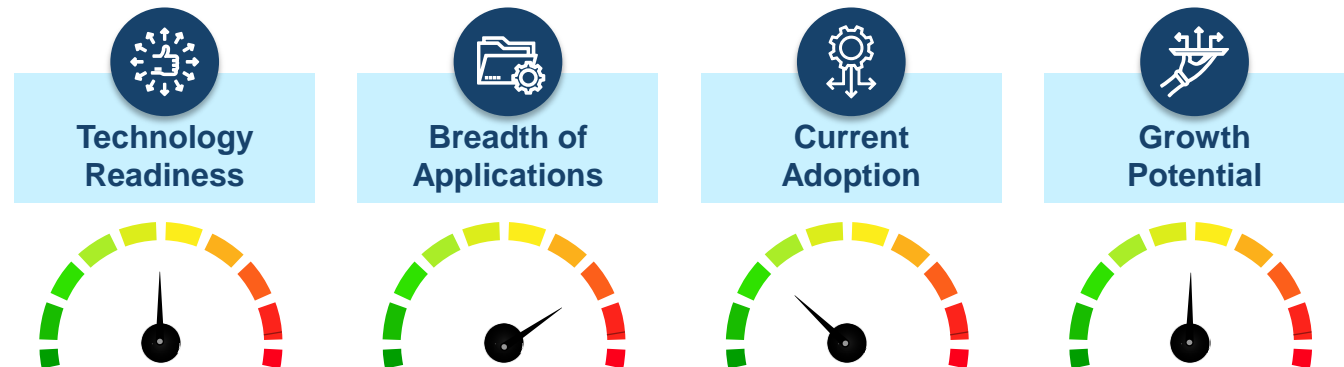
Market Restraints

Top Market Participants



- SoftBank Robotics
- Luvozo
- Ubtech
- Hanson Robotics
- Intuition Robotics
- Honda Robotics
- Blue Frog Robotics
- Paro Robots

Opportunity Assessment



Key players

Companion Robots/Personal Assistants

Hanson Robotics

Overview



Headquarters: Hong Kong

Year Founded: 2003

Funding: \$21.7M

No. of employees: 45

Target Market



Social Robotics across a variety of applications

Hanson's robots serve as AI platforms for research, education, medical and healthcare, sales and service, and entertainment applications. Within healthcare, Hanson robots have been used in autism treatment, age-related disease research and safety testing at the US Centers for Disease Control, as well as Covid-19 safety.

Value proposition



Hanson Robotics is an AI and robotics company dedicated to creating human-like socially intelligent machines that improve quality of life. Hanson's AI suite of general purpose, rapid developer tools, API, and SDK, support both product development and research.

Existing Partnership Types



Singularity Studio (AI)
iTutorGroup (e-learning solutions)
CereProc (advanced speech synthesis research)

Technology Readiness Level

R&D

Prototype

Commercial

Partnership Alignment

Low

High



Key players

Companion Robots/Personal Assistants

Intuition Robotics

Overview



Headquarters: Israel

Year Founded: 2015

Funding: \$36 million in a series B round of funding co-led by Sparx Group and OurCrowd, with participation from Samsung Next, Toyota AI Ventures, Bloomberg Beta, iRobot, Sompo Holdings, Union Tech Ventures, Happiness Capital, and Capital Point.

No. of employees: 50-100

Target Market



Healthcare (Long term care facilities and Elderly Patients)

The robot uses voice activation and natural language processing to convey a message or emotion — including shifting its position and using sound and light to express itself.

Unlike other voice assistants, ElliQ does not require a prompt, and can proactively engage in conversations with the user.

Value proposition



The company offers ElliQ® social companion robot for elderly population. The company's value proposition is offering a digital companion (not an assistant) that fully understand context and can make decisions based on preset goals.

Existing Partnership Types



Toyota AI Ventures
Samsung NEXT
iRobot

Technology Readiness Level

R&D

Prototype

Commercial

Partnership Alignment

Low

High



Global robotics landscape in healthcare and wellbeing:

3. Care Robots

3.2 Assistive Robots Market Overview (Includes elderly or immobile patient assistance and carriers and rehabilitation robots)

Market Drivers

- Large population of chronically ill and disabled population that are also socially isolated
- Need for personalised care and ensuring patient engagement to therapy, medication adherence etc.
- New use cases such as companions for autistic children, rehab for substance abuse etc.



- Inclusion of rehabilitation robots in physical therapy is limited and needs to be increased to improve adoption



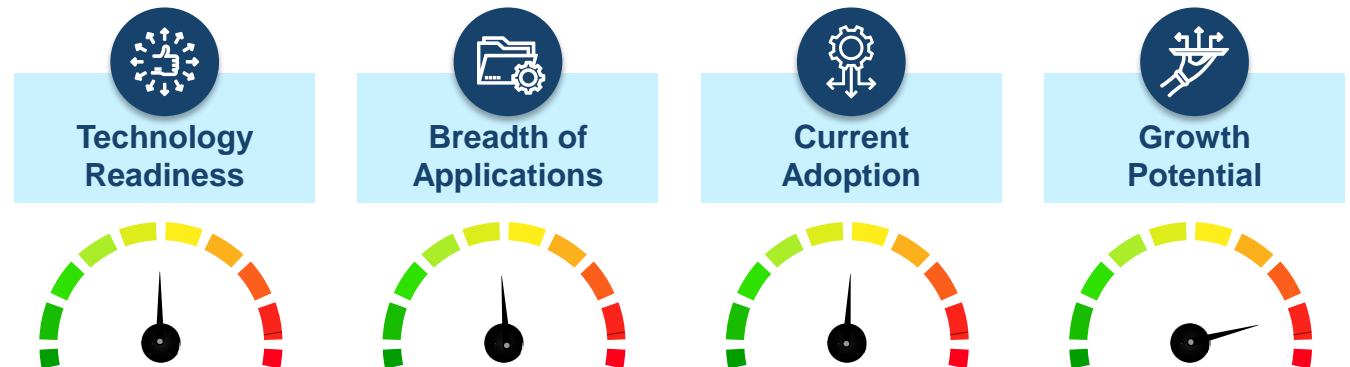
Market Restraints

Top Market Participants



- PTR Robots
- Kinova Robotics
- Focal Meditech
- SoftBank Robotics

Opportunity Assessment



Key players

Assistive Robots (Rehabilitation)

Bionik Laboratories

Overview



Headquarters: Toronto, Canada

Year Founded: 2010

Funding: \$15.9 M, Ginger Capital Investment Holding Ltd and DMZ are the lead investors

No. of employees: 11-50

Value proposition



The company offers robotic solutions for rehabilitation with data-driven, robotic assisted therapy systems that transform neurorecovery.

Technology Readiness Level

R&D

Prototype

Commercial

Target Market



Healthcare (Hospitals, Hospice Care, Assisted Living Centers)

InMotion Interactive Therapy improves upper-extremity motor retraining for patients with neurological conditions and injuries. The InMotion ARM, ARM/HAND and WRIST Robots greatly enhance the therapist's ability to drive repetition and neuroplasticity, helping to restore motor function and improve outcomes.

The company is developing products in the field of wearable rehabilitation robots and exoskeletons.

Existing Partnership Types



- Inteliware Development to provide seamless connectivity between InMotion™ Robotic Devices at hospital information systems.
- Propel, product success platform built on Salesforce for product lifecycle management and quality management system solutions provider to accelerate new product development and manufacturing of InMotion™ products and services.
- Bionik Laboratories and Wistron corporation has a partnership to develop exoskeleton technologies for consumer medical device market.

Partnership Alignment

Low

High



PTR Robots – (Patient Transfer & Rehabilitation)

Overview



Headquarters: Denmark, Odense (PTR Robots is a subsidiary of Blue Ocean Robotics)

Year Founded: 2016

Funding: €1M seed funding (Blue Ocean Robotics total investment is \$48.7M)

Investors in PTR: Rikkesege Invest, M. Blæsbjerg Holding, DAHL Holding, Syddansk Innovation.

No. of employees: 7

Value proposition



PTR, jointly developed with healthcare professionals, is a mobile, intelligent robot that helps individuals with impaired functions. Through transfer and rehabilitation tasks, it helps relieve the strain on staff and also reduces the risk of infection, because only one caregiver needs to be present to perform a patient transfer

Technology Readiness Level

R&D

Prototype

Commercial

Target Market



Hospitals and nursing homes:

- According to PTR, one out of four bedridden patients in a typical hospital needs assistance with transfer and rehabilitation. This need is even more pronounced at nursing homes.
- Transfer from bed to wheelchair, stretcher to bed, bathroom etc.
- Rehabilitation: Sit to stand and gait training are supported by the robot meaning less passive transfers and more efficient rehabilitation

Existing Partnership Types



- Public-private innovation project between Blue Ocean Robotics and University Hospital Køge in Region Zealand
- CareNet - Nationalt Netværk for Velfærdsteknologi, (a Danish national network for welfare technology)

Partnership Alignment

Low

High



Key players

Assistive Robots (Social and Therapeutic)

Focal Meditech

Overview



Headquarters: Netherlands

Year Founded: 1992

No. of employees: 36

Privately Held

Target Market



Healthcare (Home and Care Facilities)

Focal Meditech offers a wide range of medical devices for people in independent living homes including personal and social robotics, arm supports and meal supports. The custom made arm support robots are aimed at people with a very limited or no hand function.

Value proposition



Focal Meditech delivers custom-made robotic medical equipment. It is an independent manufacturer, importer, exporter and supplier of high end assistive devices that contribute to independent home living.

Existing Partnership Types



Universities
Rehabilitation Centres
Technology Institutes

Technology Readiness Level

R&D

Prototype

Commercial

Partnership Alignment

Low

High



Global robotics landscape in healthcare and wellbeing:

3. Care Robots

3.3 Advanced Prosthetics and Exoskeletons Market Overview

Market Drivers

- Provides higher functionality including dexterity, natural mobility, and sense of touch to missing or paralyzed limbs and improves quality of life.
- Traditional prosthetics are heavy, cumbersome, and expensive, and needs to be replaced, while advanced prosthetics can be reconfigured.



- Varying prices (and impact on reimbursement) of prosthetics due to need for customization (cannot be mass produced)



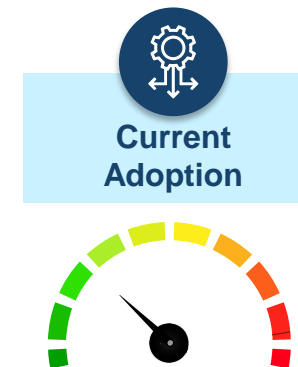
Market Restraints

Top Market Participants



- Össur
- Ottobock SE & Co. KGaA
- Cyberdene
- Ekso Bionics
- US Bionics (SuitX)
- ReWalk Robotics
- Rex Bionics
- Bionik
- Bio-xtreme
- Blatchford Group
- Mobius Bionics
- Willow Wood Global LLC

Opportunity Assessment





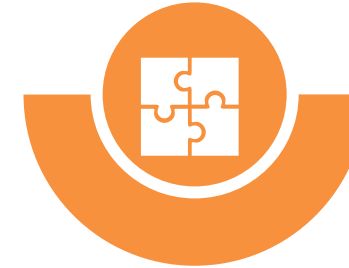
In terms of revenue and expertise, **industrial robotics** is the leading area for robotics in Finland.



Finland's strengths are in **engineering, manufacturing and machine building**.



The largest potential for partnerships would lie in **Healthcare Service Robotics**, particularly autonomous/auxiliary robots and medication delivery and dispensing.



Areas where the market is **fragmented with more potential** to capture a share include: assistive robots, diagnosis, prosthetics and exoskeletons, and companion robots.



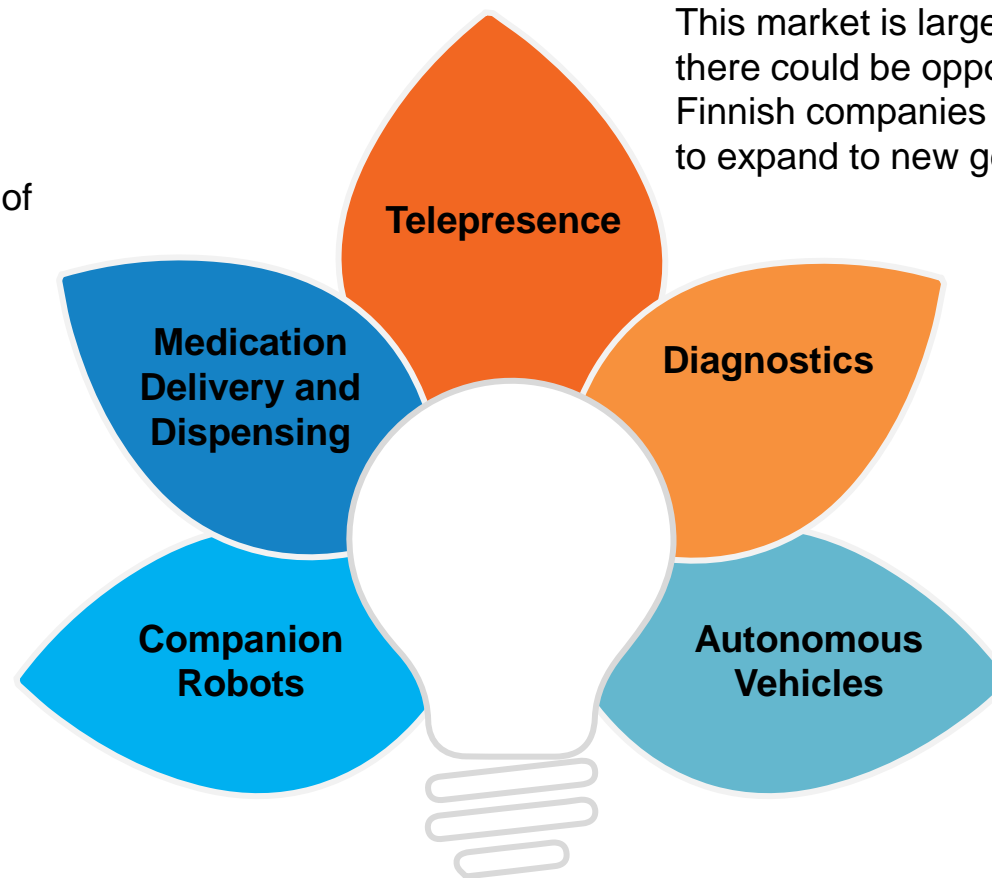
For diagnosis in particular, Finnish companies have strong capabilities in **machine vision and pattern recognition** and analyzing data at the algorithmic level.

Summary and Recommendations for Finnish Businesses

The global healthcare sector is facing **increasing demand for services** due to ageing populations, growth in chronic diseases, budget constraints, and a shortage of qualified workers. The **healthcare robotics market** is at an interesting stage of development with many applications **moving from R&D and prototype to fully commercial**. Finnish companies should consider the following markets and applications when looking for partnership opportunities:

Aligns with Finland's strengths in engineering and machine building and there are a number of companies in Finland with expertise in this market. There are also a high number of start-ups or small-medium companies in this space globally, which could offer opportunities for Finnish companies.

Ageing populations and care solutions for the home are driving the growth of this market. Finnish companies are already active in this space. The market is still to mature and would benefit from viable business models.



This market is largely mature, but there could be opportunities for Finnish companies to find partners to expand to new geographies.

Covid-19 has rapidly increased demand in this market. There are also many companies in R&D and prototype stage, offering high opportunities for partnership.

This market also aligns with Finland's strengths in engineering and machine learning. It is a high growth market.

APPENDIX

Finnish Robotics Market Snapshot

Healthcare Robot Initiatives

SARA

The aim of the Social & Autonomous Robotic Health Assistant (SARA) project was to develop a robot that would ease the workload of care facility staff. The robot was developed collaboratively by four project partners: Forum Virium Helsinki from Finland, Bright Cape Holding from the Netherlands and Technische Universität Berlin from Germany.



The Well-being and Health AI & Robotics (AiRo) Programme

The objective of the AiRo programme is to speed up the utilization of artificial intelligence and robotics in the well-being and health services and operating processes in Finland.



Robots and the Future of Welfare Services (ROSE)

This project examines how advances in service robotics can enable the innovation of social and health services especially with regards to the needs of ageing populations.



BioXtreme

Overview

Headquarters: Rehovot, Central District, Israel

Year Founded: 2010

Funding: R&D grant from the Israel Innovation Authority (coupled with additional investment from our strategic investor) totalling \$1M.

No. of employees: 11-50

Value proposition

BioXtreme has developed a robotic system that helps with upper limb motoric rehabilitation. deXtreme™ performs automatic rebuild of motion range and capability through adaptive/intuitive learning.

With this robot rehabilitation, neurorehabilitation time for stroke patients is expected to be shortened by up to 30%-50%.

deXtreme™ is ready for commercialisation and is US FDA registered.

Target Market

Healthcare (Hospitals, Hospice Care, Assisted Living Centers)

The robot offers patients motoric error enhancement in a combined VR environment to restore and rehabilitate motion and dexterity. The enhanced error forces stimulate an adaptive corrective response from the patient, which leads to the regulation of the system until the desired trajectory is accomplished by the patient. The process shortens upper limb therapy time by up to 50% and patients achieve 100% additional motor improvement compared to traditional physical therapy methods.

Existing Partnership Types

Heliomare rehabilitation hospital in the Netherlands

Partnership Alignment

Low High

Technology Readiness Level

R&D Prototype Commercial



Ekso Bionics

Overview

Headquarters: USA - California

Year Founded: 2005

Funding: \$70.8M (Public, Listed)

No. of employees: 77

Value proposition

Ekso Bionics was founded in 2005 in collaboration with the Berkeley Robotics and Human Engineering Laboratory of the University of California, Berkeley. It develops exoskeleton solutions to enhance human mobility, strength, and endurance across medical and industrial applications. The latest additions to the Company's medical portfolio include the EksoNR exoskeleton, which is the next generation EksoGT-- the most clinically used robotic exoskeleton, and the upgraded EksoPulse platform, an advanced cloud-based analytics solution that measures and analyzes progress using EksoNR. Ekso Bionics was the 2020 winner of the "Best Healthcare Robotics Company" award in the fourth annual MedTech Breakthrough Awards program..

Target Market

Rehabilitation centres

Developed for neurorehabilitation, EksoNR is an intuitive exoskeleton device that empowers patients recovering from stroke or other conditions to learn to walk again with a more natural gait. Ekso Bionics designed EksoNR with new features to help physical therapists and patients get more out of rehabilitation sessions.

Existing Partnership Types

Rehabilitation centres
Hospitals

Partnership Alignment



Technology Readiness Level



GoBe (Blue Ocean Robotics)

Overview

Headquarters: Denmark, Odense

Year Founded: 2019

Funding: (Blue Ocean Total Funding = \$48.7M)

No. of employees: Unknown (Blue Ocean = 220)

Value proposition

GoBe Robots is a global leader in telepresence, offering companies state-of-the-art telepresence to transform human interaction in an increasingly virtual world. The robots are used worldwide to facilitate corporate meetings, production facility inspections, teaching in schools, hospital consultations, museum visits and much more. GoBe has recently announced a new generation of its climate-friendly telepresence robots with significant demand driven by the COVID-19 pandemic. As Covid-19 spreads, GoBe Robots have emerged as an effective tool in preventing the spread of coronavirus and overcoming closed borders, while reducing travel budgets, working hours and transport time.

Target Market

Businesses, Hospitals, Schools/Universities

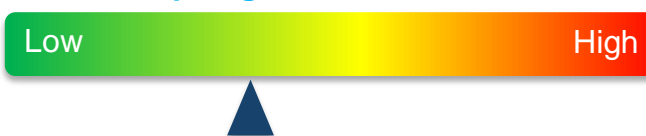
Within healthcare, GoBe Robots brings professionals and patients together across distances to provide better outcomes, broader access, quicker responses and a more personal touch. The robots also give experts and family the capability to check in on patients at home.

Existing Partnership Types

Hospitals

RoBi-X - Partnership programmes for co-creation of robots.

Partnership Alignment



Technology Readiness Level



InTouch Health (part of Teladoc Health)

Overview

Headquarters: USA – California

Year Founded: 2002

Funding: \$49.2M (recently acquired for \$600M)

No. of employees: 350

Value proposition

InTouch Health is a telehealth services company that offers healthcare providers solutions to deliver virtual care for a broad array of use cases and healthcare environments. It provides a reliable, dedicated cloud-based network and virtual care solutions designed to ensure connectivity for health systems, providers, and patients at all times. InTouch has partnerships with more than 450 hospitals and health systems, and worldwide is supporting over 3,600 care sites. Its enterprise offering provides support for over 40 clinical use cases. It has been awarded the 2020 Best in KLAS distinction for Virtual Care Platforms in the “2020 Best in KLAS: Software & Services” report for the third consecutive year.

Target Market

Healthcare (Hospitals and Care Facilities)

The InTouch Virtual Care Platform enables clinicians to deliver high-quality virtual care in high and low acuity settings across service lines, such as on-demand urgent care, behavioral health, cardiology, neurology (telestroke), infectious disease, endocrinology, wound care and many more.

Existing Partnership Types

Hospitals

Care Facilities

Intuitive Surgical

Mako Surgical

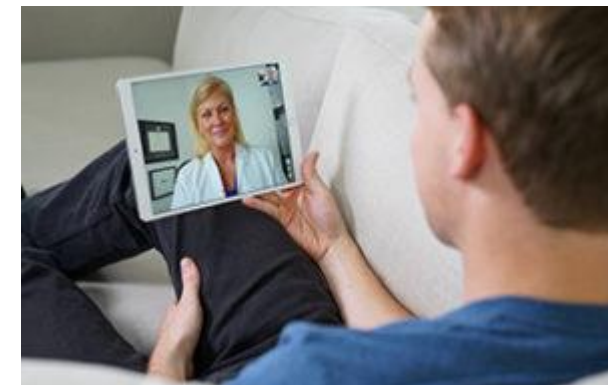
GE Healthcare (for clinical education and training)

KARL STORZ (endoscope and integrated operating room manufacturer)

Partnership Alignment



Technology Readiness Level



Mobius Bionics

Overview

Headquarters: Manchester, United States

Year Founded: 2016

Funding: \$39.5 million by Camp One Ventures

No. of employees: 11-50

Value proposition

Mobius Bionics is a medical device company offering advanced prosthetics for upper limb amputees or disabilities.

The company's flagship product LUKE arm is a commercially-available prosthesis with 10 powered joints that offers multiple configurations enabling better dexterity and functionality.

The LUKE arm is the first arm cleared by the US FDA as a fully integrated prosthetic arm for amputees across a range of levels of amputation, including shoulder-level, above-elbow, and below-elbow.

Target Market

Healthcare (Hospitals, Rehabilitation Centres, Patients with Disabilities)

Luke arm provides 10 powered joints, multiple grip patterns, and a flexible control system that allows the arm to be controlled by a variety of input devices. In addition to the many control input options, the LUKE arm may be controlled with Inertial Measurement Units (IMUs) that are typically worn on the user's shoes. They read the tilt of the user's foot and interpret each movement like a joystick to control the arm.

Existing Partnership Types

Next Step Bionics and Prosthetics

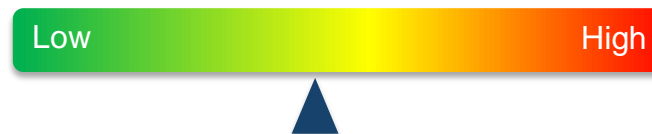
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Biodesigns Inc

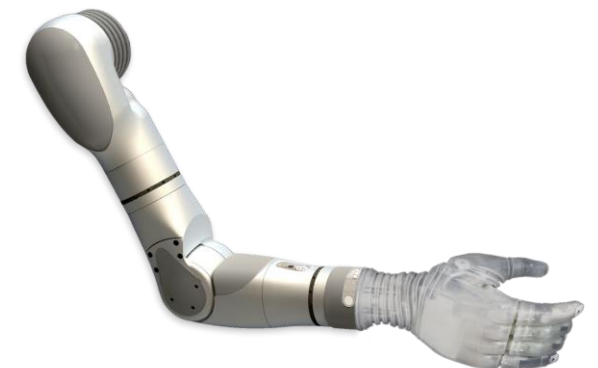
Handspring

Arm Dynamics

Partnership Alignment



Technology Readiness Level



Omnicell

Overview

Headquarters: USA - California

Year Founded: 1992

Funding: \$20M

No. of employees: 2,700

Value proposition

Omnicell is a global leader in medication and supply dispensing automation, pharmacy automation, IV compounding technology, analytics software, and medication adherence solutions. Omnicell robotic dispensing solutions automate medication dispensing, sorting, packaging, and retrieval. This technology unites with an embedded layer of intelligence to deliver crucial, real-time pharmacy optimization and insights. Together, these tools and technology can free up clinicians for more patient-focused activities.

Target Market

Healthcare (Hospitals, non-acute care facilities, retail pharmacies, patients)

Omnicell focuses on providing the most comprehensive medication and supply management portfolio in the industry that stretches across the entire continuum of care - from acute care hospital settings to post-acute skilled nursing and long-term care facilities to the patient's home.

Existing Partnership Types

Hospitals and Hospital Trusts

Healthcare providers

Pharmacies

Kit Check (machine learning and advanced tracking technology)

Partnership Alignment



Technology Readiness Level



ReWalk Robotics

Overview

Headquarters: USA

Year Founded: 2001

Funding: 102.7M (Public Company listed 2014)

No. of employees: 50

Value proposition

The company is focused on improving quality of life for individuals with lower limb disabilities through the creation and development of robotic technologies. ReWalk Robotics currently offers its ReStore solution for stroke rehabilitation and ReWalk solution for individuals with spinal cord injuries. ReWalk is a wearable robotic exoskeleton that provides powered hip and knee motion to enable individuals with spinal cord injury (SCI) to stand upright, walk, turn, and climb and descend stairs. ReWalk is the first exoskeleton to receive FDA clearance for personal and rehabilitation use in the United States.

Target Market

The ReWalk is for individuals with lower limb disabilities such as paraplegia. The technology is designed for all-day use at home, at work, and in the community.

Existing Partnership Types

YASKAWA Electric Company (Industrial robotics)

Timwell Corporation Limited (medical devices)

Health Insurance Companies

Partnership Alignment



Technology Readiness Level



Rutgers, State University of New Jersey

Overview

Headquarters: New Jersey, USA

Year Founded: N/A

Funding: University Research Grants.

No. of employees: Department of Biomedical Engineering
(not registered as a company)

Value proposition

The university has performed clinical trials for a table top device that combines a robot, artificial intelligence and near-infrared (NIR) and ultrasound (US) imaging to draw blood or insert catheters to deliver fluids and drugs.

In next steps, device can serve as a platform to merge automated blood-drawing and downstream analysis of blood, and can extend to procedures such as IV catheterization, central venous access, dialysis and placing arterial lines.

Target Market

Healthcare (Hospitals, Public Health Systems, Labs)

Over 90% of diagnostic and therapeutic procedures in the emergency room, intensive care unit, catheterization lab and operating room require gaining vascular access. Approximately one billion vascular access procedures are performed annually in the United States (and approximately four billion procedures worldwide). The robot simplifies blood drawing process using: NIR imaging that provides non-contact visualization of superficial vessels over a broad (20 × 15 cm) field of view, while US imaging allows focal visualization of a target vessel and facilitates submillimetre pose adjustments to compensate for vessel motion. The device is further capable of drawing blood into sample collection vials or advancing peripheral catheters up to 25 mm beyond the access point.

Existing Partnership Types

Hospitals
Research Organisations

Partnership Alignment

Low

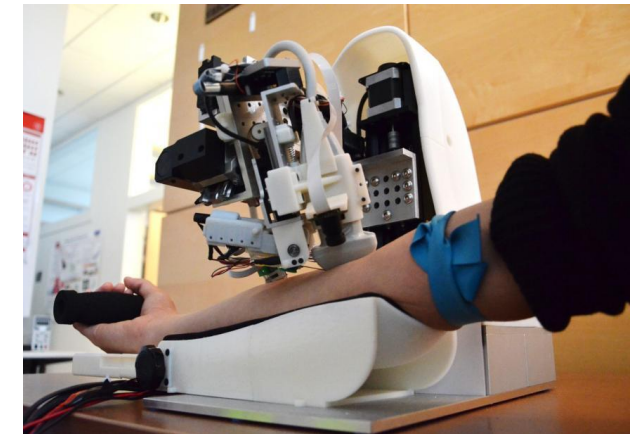
High

Technology Readiness Level

R&D

Prototype

Commercial



UVD (Blue Ocean Robotics)

Overview

Headquarters: Denmark, Odense

Year Founded: 2016

Funding: (Blue Ocean Total Funding = \$48.7M)

No. of employees: Unknown (Blue Ocean = 220)

Value proposition

Blue Ocean's UV-C robot is clinically proven to kill 99.99% of viruses and bacteria on surfaces and in the air in a patient room within approximately 10 minutes of autonomous operation. In 2020, Blue Ocean Robotics was been included in Robotics Business Review's list of the 50 most influential robotics companies in the world for its UVD Robots. The recognition was earned for the health benefits of its technology as well as continued growing demand for its safe disinfecting capabilities. The company's self-driving, disinfecting robots have been rolled out to more than 60 countries worldwide.

Target Market

Hospitals and other places for public gatherings

In December 2020, UVD announced that the European Commission awarded it a contract to supply 200 disinfection robots to hospitals in 10 countries across the European Union. UVD Robots is also seeing growing interest from nursing homes and other healthcare institutions, schools and day care centers, shopping malls, cruise ships and commercial airports.

Existing Partnership Types

Odense University Hospital (and other hospitals)

Robot Distributors

Disinfection and decontamination solution providers

Partnership Alignment

Low

High

Technology Readiness Level

R&D

Prototype

Commercial



Xenex - LightStrike Robot

Overview

Headquarters: USA –San Antonio, TX

Year Founded: 2009

Funding: \$91.4M

Investors: 9 including Battery Ventures, Essex Woodlands Healthcare Partners, Piper Jaffray Merchant Services and Tectonic Ventures.

No. of employees: 51-100

Value proposition

Xenex is the world leader in UV disinfection for healthcare facilities and is the global industry standard for effective, safe, and fast UV room disinfection. More than 650 healthcare facilities worldwide use the company's LightStrike robots for room disinfection, including acute care hospitals, long-term care facilities, outpatient surgery centers, nursing homes, and medical office buildings. As a result of the COVID-19 pandemic and the world's focus on preventing disease transmission, organizations outside of healthcare are quickly adopting Xenex's robots for disinfection, including hotels, government buildings, schools, professional sports facilities, police stations, pharmaceutical cleanrooms, and food processing facilities.

Target Market

Healthcare (Hospitals)

Xenex's LightStrike Germ-Zapping Robots can decontaminate up to 65 rooms per day. Xenex is the first and only UV room disinfection technology proven to deactivate SARS-CoV-2, the virus that causes COVID-19. The LightStrike robot achieved a >99.99% level of disinfection against SARS-CoV-2 in 2 minutes. The \$125,000 cost per robot translates to about \$2 to \$8 per room depending on the number of rooms it's used in each day.

Existing Partnership Types

Hospitals

Partnership Alignment

Low

High

Technology Readiness Level

R&D

Prototype

Commercial

