

World *Robotics*

S e r v i c e R o b o t s

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Statistics, Market Analysis and Case Studies

The cover features a light blue world map background. On the left, a vertical grey bar contains the text 'one market' in white, lowercase, cursive font. The main title 'World Robotics' is centered, with 'World' in a large, grey, sans-serif font and 'Robotics' in a large, black, cursive font. Below this, 'Service Robots' is written in a smaller, grey, sans-serif font, underlined. At the bottom of the title section, the year '2023' is displayed in a grey, sans-serif font.

World Robotics

Service Robots

2023

World Robotics 2023 – Service Robots

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The service robot statistics is carried out by the IFR Statistical Department.

Chapter 3 is co-edited by Dr. Werner Kraus, Head of Department Robot and Assistive systems with his team Dr. Birgit Graf, Head of the Group “Personal and Domestic Robotics”, and Kevin Bregler, Head of the Group “Industrial and Commercial Service Robots”, both at Fraunhofer Institute for Manufacturing Engineering and Automation IPA, Stuttgart (Germany) in close collaboration with scientists from their research groups.

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We express our most sincere gratitude to all partners!

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Editorial

By: Axel Weber, Vice President KUKA Medical Robotics



Challenges for future health care systems and potential answers through medical robotics

To fully understand the inherent value of medical robotics, one must first understand the fundamental challenges within most of the world's health care systems. The global mega trend of ageing societies is altering demographics, through which rising prevalence and incidence of age-related diseases can be observed. The WHO (World Health Organization) expects the proportion of the world's population above 60 to almost double from 12% to 22% between 2015 and 2050¹ and while the years of good health extend for individuals, the prevalence of age-related diseases like hearing loss, cataracts and refractive errors, osteoarthritis, chronic obstructive pulmonary disease, diabetes, depression, and dementia is expected to increase significantly.

The value-based health care concept may be leveraged to understand the challenges more thoroughly. All health care services are leading to a care outcome whose quality can be measured on individual level as well as statistically registered. Those services lead to associated direct and indirect cost and its magnitude regarding the service determines the value of health care. This rather straight forward concept is deeply refined through various tools and methods within the realm of health economics to plan and control the delivery of care.

In the interplay of outcome and cost, medical robotics has great potential in the different care settings. It is showing the most extensive history in the inpatient setting where it demonstrated its efficacy in health technology assessments, improving outcomes in selected procedures. This procedure set is continuously being extended not only to inpatient, but outpatient and rehabilitation settings as well. This leads to an increasing impact for patients and health care professionals not only through improved outcomes, but reduced procedure times, reduction of labor resources in times of labor shortage or even the access to care where it was previously limited. The inherent potential of robotics for automation is rarely being harnessed though and generally follows the master-slave principle where the medical professional is in control anytime. We see some exceptions in microsurgery like LASIK to treat refractive errors or in diagnostic imaging, but the vast majority follows that principle.

The mere fact that a procedure can be performed while utilizing collaborative medical robotics or even being autonomously carried out is insufficient proof. Through the

¹ World Health Organization 2022, Ageing and health, accessed 15 June 2023, <<https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>>

methods of health technology assessments, clinical trials, outcome measurements and cost analysis we are less likely to fall for the fallacy of technological feasibility. Medical robotics is facing boundaries and legitimate challenges through regulatory barriers on one hand, but softer factors like human reservations on the other. Care has traditionally been delivered in close proximity to the patient, brought on a distance for example during diagnostic imaging using radiation sources, and can now be carried out over global distances via tele consultations or tele-manipulated treatments. On patient and on health care professional side this may lead to approval or rejection which should be taken into account from the very early stages of product development. This gains even more significance when targeting consumer health care or future home care solutions.

The utilization of complex and digitized devices like medical robots bears the opportunity of integrated connection to additional digital tools. We see great progress in the areas of digital health, predictive analytics, care planning and hospital information systems whose application space is limited to the digital world. Its outputs may be leveraged in the physical world though through the extraction of information, so they may also be coupled with the physical manipulation capabilities of robotics. Those digitized devices can receive outputs from and deliver inputs to digital entities which are already integrated into care delivery routines like procedure planning, process parameter tracking or process mining.

A multitude of health care procedures may benefit from physical manipulation performed through robotic solutions to create additional value in outcomes or cost. To build a robotics solution from scratch, significant robotics expertise in the field of software and hardware as well as educated and trained staff are required. When creating a robotics solution for an existing device or attempting to set up a new product, integrators may find it advantageous to engage external providers of robotics components and expertise. In buy-or-build decisions a conversation can help for evaluation as well as feasibility. A company like KUKA may be the ideal partner for co-creating something new without having to establish the full set of expertise. It has the right resources and pre-certified products for medical use to bring robotic solutions to all diagnostic and therapeutic areas.

The underlying trends in demographics and the challenges in outcome and cost for health care systems call for innovation and efficient solutions. The robotics industry has a proven record and gathered expertise in the past decades that can be extended to adjacencies that might not be fully obvious yet still adapt to its market dynamics. The potential for automation, reduction of procedure times, improvement of outcomes, the purposeful use of human labor are all factors speaking for an increased utilization of those capabilities.