Executive Summary World Robotics 2018 Service Robots

The total number of professional service robots sold in 2017 rose considerably by 85% to 109,543 units up from 59,269 in 2016. The sales value increased by 39% to US$ 6.6bn. The reason for this rather low increase rate is the considerable decrease of high valued defence robots. Since 1998, a total of about 395,000 service robots for professional use have been counted in these statistics. It is not possible to estimate how many of these robots are still in operation due to the diversity of these products resulting in varying utilization times. Some robots (e.g. underwater robots) might be more than 10 years in operation (compared to an average lifetime of 12 years in industrial robotics). Others like defence robots may only serve for a short time.

The main applications are:

- Logistic systems
- Defense applications
- Public relation robots
- Field robots (milking robots)
- Powered human exoskeletons
- Medical robots

69,000 logistic systems were installed in 2017, 162% more than in 2016 (26,294), accounting for 63% of the total units and 36% of the total sales (in value) of professional service robots. 6,721 automated guided vehicles in manufacturing environments and 62,211 in non-manufacturing environments are building up this increase of 162% compared to automated guided vehicles sales numbers in 2016. It is assumed that the actual number of newly deployed systems is far higher. The value of sales of logistic systems is estimated at about US$ 2.383m, and increased by 138% compared with 2016.

With 11,992 units, service robots in defence applications accounted for 11% of the total number of service robots for professional use sold in 2017. Thereof, unmanned aerial vehicles seem to be the application with the highest share and their sales increased by 5% to 10,260 units. A number of 1,380 unmanned ground based vehicles, which include e.g. bomb fighting robots, were sold, 33% more than in 2016. The number of demining robots was 352 units in 2017, compared to 320 units in 2016. The value of defence robots can only roughly be estimated. It was about US$ 902m, 14% more than in 2016. This number accounts for about 14% of the total sales of professional service robots. However, the true number as well as the value might be considerably higher.

A strongly growing sector are public relation robots. Almost 10,400 units were sold in 2017, 56% more than in 2016. Most of these robots were telepresence robots, robots for mobile guidance and information with a sales volume of 10,043 units in 2017 up from

6,388 units in 2016. The total value of public relation robots sales increased by 41% to US$ 177m.

A total of 5,386 milking robots were sold in 2017 compared to 5,279 units in 2016, representing a 2% increase. Dairy farmers suffered financially. As a result, investments were moved forward and takeovers were postponed. Also other robots for livestock farming such as mobile barn cleaners or robotic fencers for automated grazing control decreased in 2017 by 14% compared to 2016 to 149. The total number of field robots sold in 2017 was 6,375 units, accounting for a share of 6% of the total unit supply of professional service robots. The sales value of field robots decreased by 2% to US$ 966m, accounting for about 15% of the total value of professional service robot sales. Agricultural robots are getting grounded in the market. Sales increased from 190 units in 2016 to 520 units in 2017.

Sales of medical robots increased by 73% compared to 2016 to 2,931 units in 2017, accounting for a share of 2.7% of the total unit sales of professional service robots. The most important applications are robot assisted surgery or therapy with 1,502 units sold in 2017, 22% more than in 2016. The total value of sales of medical robots increased to US$ 1.911m, accounting for 29% of the total sales value of the professional service robots. Medical robots are the most valuable service robots with an average unit price of at least US$ 0.651m, including accessories and services. Therefore, suppliers of medical robots also provide leasing contracts for their robots. Medical robots as well as logistic systems are well established service robots with a considerable growth potential.
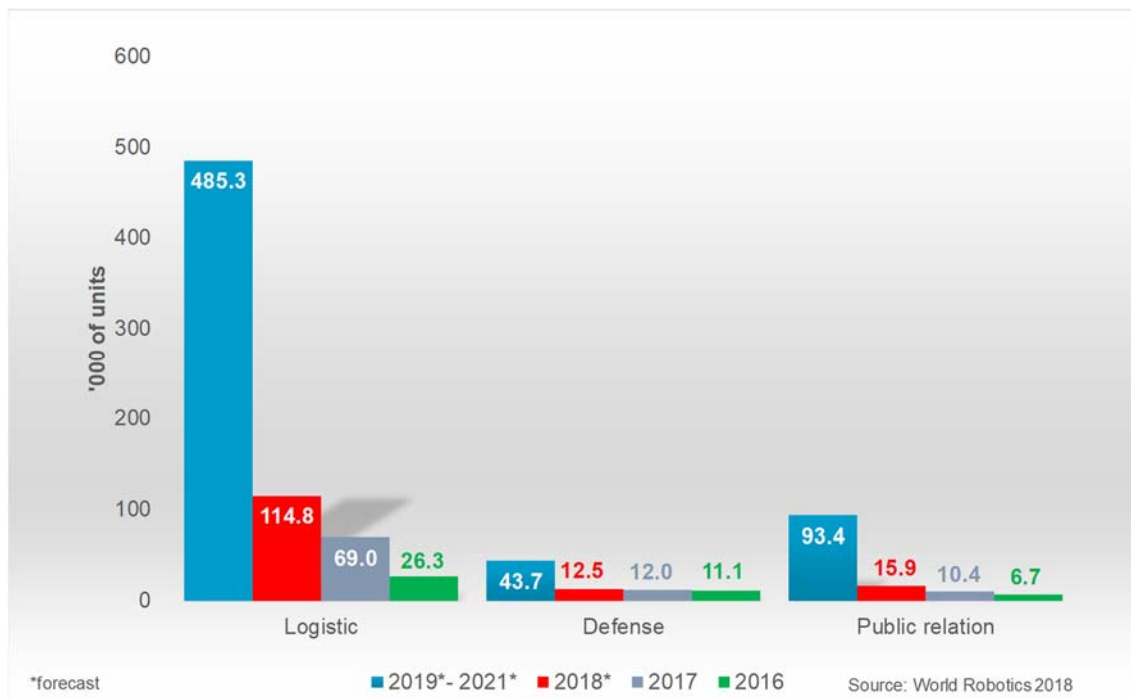
Service robots for professional use in main applications. Unit sales 2016 and 2017, forecast 2018 and 2019-2021.

Sales of powered human exoskeletons were up from 5,581 units in 2016 to 6,068 units in 2017. These robots are successfully used for rehabilitation and ergonomic support for reducing loads and have a high growth potential.

Annual sales units of all other categories of professional service robots are below 1,000 units: professional cleaning, demolition and construction robots, inspection and maintenance systems, rescue and security applications, underwater systems and mobile platforms in general use.
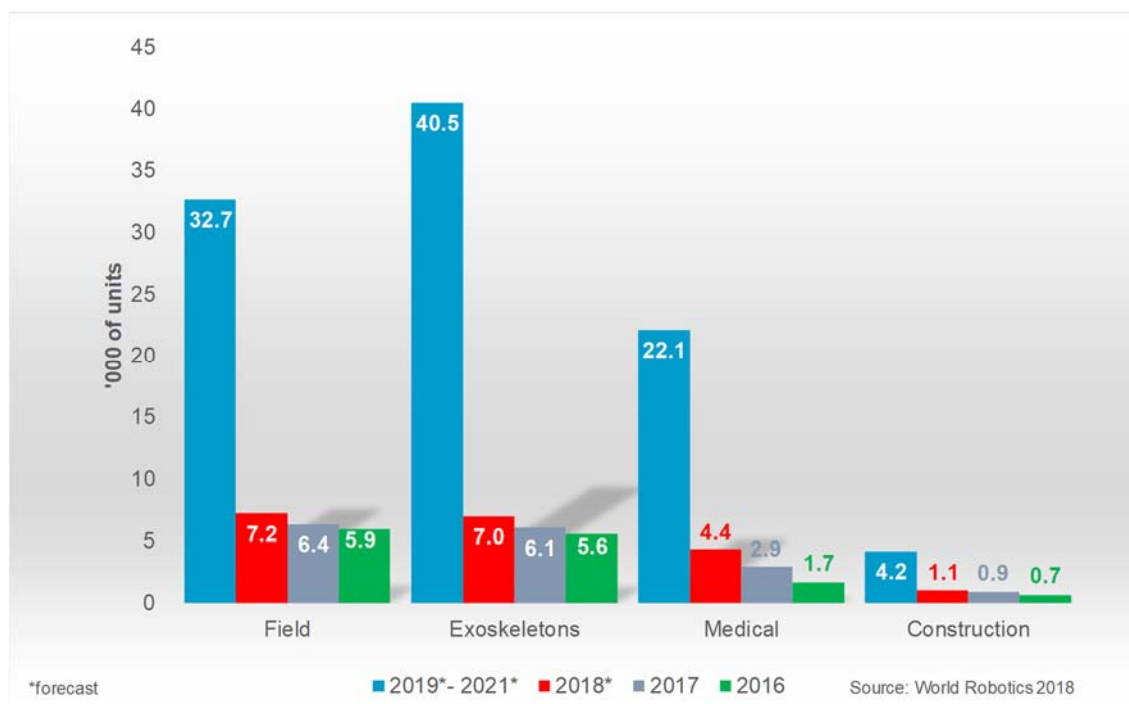

Service robots for professional use in more applications. Unit sales 2016 and 2017, forecast 2018 and 2019-2021.

The total number of service robots for personal and domestic use increased by 25% to about 8.5 million units in 2017. The value was up by 27% to US$ 2.1bn.

Service robots for personal and domestic use are recorded separately, as their unit value is generally only a fraction of that of many types of service robots for professional use. They are also produced for a mass market with completely different pricing and marketing channels. So far, service robots for personal and domestic use are mainly in the areas of domestic (household) robots, which include vacuum and floor cleaning, lawn-mowing robots, and entertainment and leisure robots, including toy robots, hobby systems, education and research.

In 2017, it is estimated that nearly 6.1 million robots for domestic tasks, including vacuum cleaning, lawn-mowing, window cleaning and other types, were sold, an impressive 31% more than in 2016. The actual number might, however, be significantly higher, as the

IFR survey is far from having full coverage in this domain. The value was about US$ 1.6bn. Compared to 2016, this represents an increase of 30%.
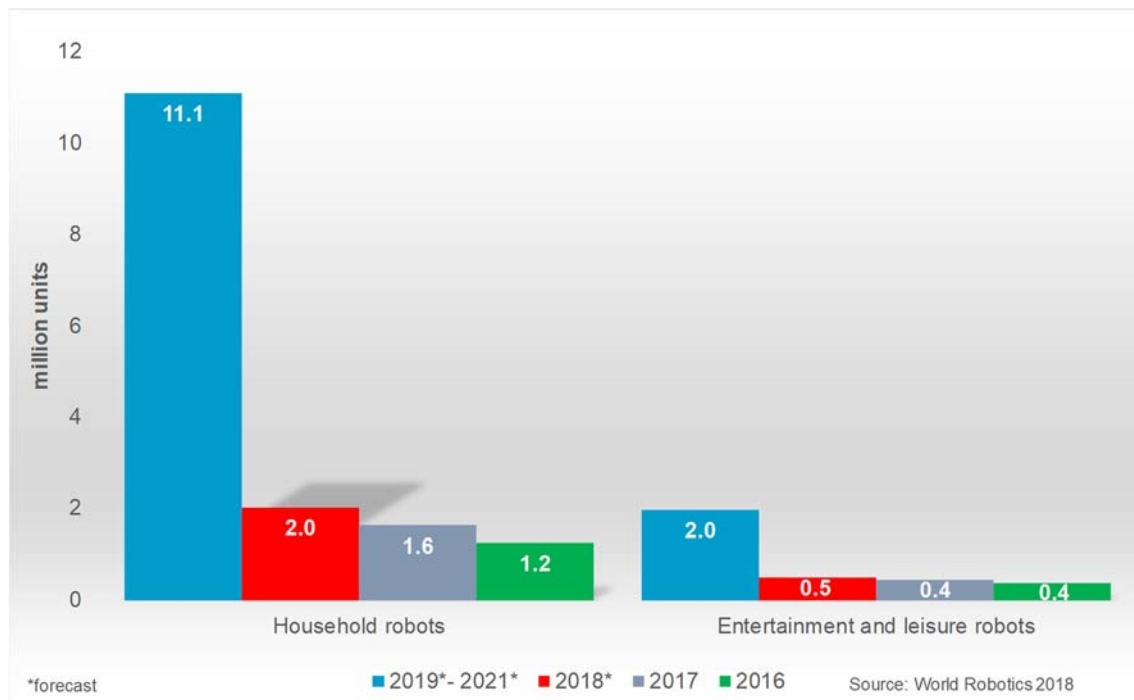
Service robots for personal/domestic use. Unit sales 2016 and 2017, forecast 2018 and 2019-2021

As for entertainment robots, about 2.4 million units were counted in 2017, 12% more than in 2016. Numerous companies, especially Asian ones, offer low-priced "toy robots". But among those mass products, there are increasingly more sophisticated products for the home entertainment market. For many years now, the LEGO® Mindstorms® programme has belonged to the more high quality products offering software environments, which reach well into high-tech robotics.

The total value of the 2017 sales of entertainment robots amounted to US$ 0.44bn.

Handicap assistance robots have taken off to the anticipated degree in the past few years. In 2017, a total of 6,423 robots were sold, up from 5,313 in 2016 – an increase of 21%. Numerous national research projects in many countries concentrate on this huge future market for service robots. In contrast to the household and entertainment robots, these robots are high-tech products.

Projections 2018 and 2019-2021 professional service robots

In 2018, total unit sales of professional service robots are estimated to increase by 32% to about 165,000 units with a value of almost US$ 8.7bn. From 2019 to 2021, almost 736,600 units will be sold.

Under the assumption of constant and continuous growth, this represents an average annual increase of 21% according to CAGR = Compound Annual Growth Rate. The value will also increase of 19% (CAGR) on average per year in the same period, reaching a total of about US$ 37bn between 2019 and 2021.

Sales of logistic systems will increase considerably in 2018, by 66% to about 115,000 units valued about US$ 3.9bn. From 2019 to 2021 another 485,000 units will be sold, an average annual increase of 18% CAGR). About 485,000 units are estimated, thereof, about 189,000 automated guided vehicles. Logistic systems make up 66% of the total forecast of service robots from 2019 to 2021. AGVs in the factory are important tools for flexible manufacturing, industry 4.0. There is a huge potential for AGVs in non-manufacturing areas, e.g. automation of e-commerce and automation of logistics in hospitals.

It is estimated that robot for defence applications will only moderately increase in 2018, by 4% to about 12,500 units. However, between 2019 and 2021 an average annual increase of about 8% is likely, about 43,700 units in total in this period.

They are followed by field robots with about 7,210 units in 2018 and 32,700 units in the period between 2019 and 2021, representing an increase of 22% (CAGR) on average per year. Investments in this sector depend highly on the financial situation of the farmers.

Another strong growing sector will be professional cleaning robots. Some 3,000 units are estimated to be sold in the period from 2019 to 2021, mainly floor cleaning systems.

A continued increase of medical robots is expected. In 2018, some 4,360 units will be sold, 49% more than in 2017. Roughly 22,100 units are estimated to be sold in the period between 2019 and 2021.

A growing sector will be mobile platforms in general use. Service robot suppliers estimate that about 2,900 mobile platforms as customizable multi-purpose platforms use will be sold in the period 2019-2021.

Exoskeletons will establish in the market. More than 7,000 units will be sold in 2018, 15% more than in 2017. Some 40,500 units are estimated to be sold from 2019 to 2021, representing an average annual increase of about 37% CAGR.

A strongly growing sector is public relation robots, which will increase by 53% to about 15,870 units in 2018 and to about 93,350 units from 2019 to 2021. These robots are increasingly used in supermarkets, at exhibitions, in museums etc. as guides or information providers. A lower number of robots for inspection and maintenance will be needed in the period from 2019 to 2021: 6,200 units.

Another growing application group is construction and demolition. Some 4,200 units are estimated to be sold in the period from 2019 to 2021. This is a rather conservative forecast. Construction and demolition robots are increasingly used in areas which are dangerous or unhealthy for humans.

These forecasts are, as mentioned earlier, based mainly on individual sales projections by companies and professional organizations. It is the opinion of the IFR Statistical Department that the forecasts should be seen as trends concerning market direction rather than actual and precise sales forecasts.

Projections 2018 and 2019-2021 personal/domestic service robots

It is projected that sales of all types of robots for domestic tasks (vacuum cleaning, lawn-mowing, window cleaning and other types) could reach almost 7.5 million units (valued US$ 2bn in 2018) and 39.5 million units in the period 2019-2021, with an estimated value of US$ 11.1bn. The size of the market for toy robots and hobby systems is forecasted at almost 2.5 million units in 2018 and 9.0 million units from 2019 to 2021, most of which are for obvious reasons low-priced. About 370,000 robots for education and research are expected to be sold in 2018 and another 1,670,000 in the period 2019-2021.

Sales of all types of entertainment and leisure robots are projected at about 2.8 million in 2018 (valued US$ 0.5 and 10.7 million units from 2019 to 2021, with a value of almost US$ 2bn.

Sales of robots for elderly and handicap assistance will be about 34,400 units in the period of 2019-2021. This market is expected to increase substantially within the next 20 years.

Overview:

Professional service robots:

2017: 109,500 units, +85%

2018: 165,300 units, +32%

2019-2021: 736,000 units, 21% (CAGR) per year on average

Service robots for domestic/household tasks:

2017: 6.1 million units, +31%

2018: 7.5 million units, +23%

2019-2021: 39.5 million units, 31% (CAGR) per year on average

Service robots for entertainment:

2017: 2.4 million units, +12%

2018: 2.8 million units, +20%

2019-2021: 10.7 million units, 12% (CAGR) per year on average