The robots are coming

BY MORENO ZANI

Robots doing work that only humans could do has long been a reality – especially in the manufacturing sector. Now, spurred more powerful computers and their ability to process information, the robotics industry is set for a boom.

In June 2012, the Organization for Economic Cooperation and Development (OECD) published the report "The Robotics Innovation challenge." This report stems from a Swedish case study and is part of a bigger OECD project based on anticipating the special needs of the 21st-century "Silver Economy" that is geared towards the creation of a series of technological innovations that will improve the living conditions of the global population. At the moment, the robotics market is segmented into two major categories: industrial robots and service robotics. The first, a bigger and more developed market, is able to enhance process efficiency by reducing costs and optimizing manufacturing processes; the second is dedicated to the development of assistive robotics to satisfy the needs of the more general populace and in particular for elder-care services.

In 2011, total revenues for industrial robots increased by 38% to 166,028 units, a record high, with the favorable trend only temporarily interrupted by the 2009 crisis. This category of robots is employed in a range of labor intensive industries, but the main impulse of this increase comes from automotive and metals manufacturing with demand from the Chinese, United States, and German markets increasing at growth rates of between 39% and 51%, but in absolute terms, still trailing the two principle markets of Japan and South Korea. It is important to note that the sales data does not incorporate certain costs (like software, peripherals and engineering) that, if taken into account, would boost the effective value of the total market by over three times. The global market for industrial robots is estimated at $25.5 billion.

The geographic breakdown is as follows:

Americas: robot sales rose to approximately 26,200 units, an average increase of 53%, a record high. Specifically:

US: 26,200 units delivered, +43%, driven by the required modernization of production facilities in order to compete with China.

Canada: 1,848 units delivered, +72% but still far off from the 2007 peak of approximately 3000 units.

Mexico: 1,938 units delivered, a new record high and more than double the units delivered in 2010.

Brazil: 1,440 units delivered, +125%.

Argentina: 407 units delivered, +323%.

Europe: robot sales increased to approximately 43,800 units with an average increase of 43%, a record high, driven by investments in the automotive industry, which registered an increase of 66% versus 2010. Specifically:

Germany: the biggest European market with 19,533 units delivered, an increase of 39%. After a strong rebound in 2010, this is the highest number of units sold in one year and accounts for about 45% of the units delivered on the Continent.

Italy: 5,091 units delivered, +13%, stemming from the automotive, food & beverage, and metal & machinery industries.

France: 3,058 robots sold, + 49% versus 2010.

Spain: 3,091 units delivered, +61%.

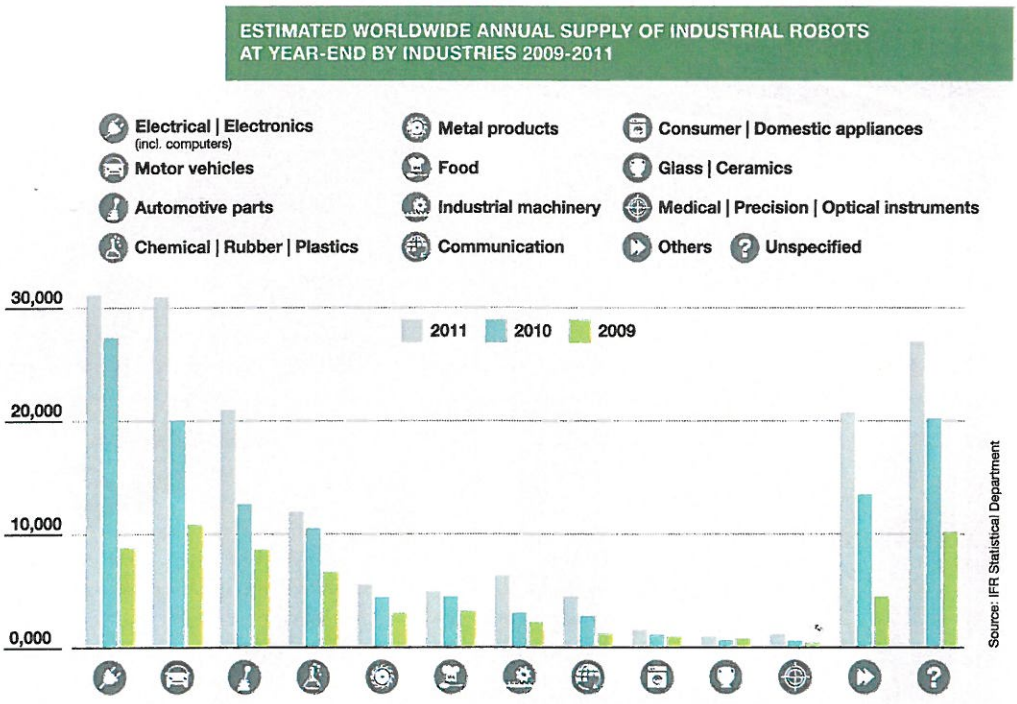
Central/Eastern Europe: +89% (number of units delivered unknown).

UK: 1,514 units, +72%.

Turkey: 864 units delivered, +156%, a record high.

Asia: the world's biggest market with over 88,700 units delivered, a record high. After a strong increase in sales in 2010, + 132%, 2011 marked a moderate increase of 27%. Specifically:

Japan: 28,000 units delivered, +27%. The automotive and electronics industries registered investments above the historic average.



South Korea: 25,536 units delivered, +9%. After the strong investments by the electronics sector in 2010 – when China was at the forefront of sales volumes – the investments in 2011 only moderately increased and the automotive sector witnessed a decline from the record high in 2010.

China: 22,577 units delivered, +51%. Between 2006 and 2011, the sales volumes almost quadrupled. In the 50-year history of the robotics market, no other country ever registered such a rapid growth, and it is only a matter of time before China becomes the overall primary market.

Southeast Asia: +41% of units delivered (number of units delivered unknown). The main market here is Thailand with over 3,500 units followed by India with 1,547 units.

The sector breakdown indicates that the automotive industry is the biggest buyer of industrial robots, up 55% compared to 2010, or two out of every three units delivered, but currently down to one unit out of every three delivered.

The electronics industry is the second biggest market, +20% (and includes computer and radio equipment, TV, communications, health, high precision, and optical instruments and products), followed by the rubber & plastic industry and the food & beverage industry.

The metal & machinery industry, with only 14,100 units, accounts for 9% of the global sales volumes of industrial robots.

The comparison of the distribution of multi-purpose industrial robots in the various countries based on the robot stock, which corresponds to the total number of robotic units, can at times be misleading. In order to take into account the differences in size of the manufacturing base of the various countries, it is preferable to utilize a more specific indicator, such as the robot density. This measure indicates the number of multi-purpose industrial robots per 10,000 persons employed in the manufacturing industry. In 2011, South Korea reached the highest robot density in the world: for every 10,000 employees, 347 industrial robots were in operation. Japan (339) and Germany (261) followed immediately after, with an average robot density in the world estimated at about 55 industrial robots in operation per 10,000 employees. The sectors with the highest robot density are the automotive and electronics industries.

Despite the weakening global economic situation, a further robot sales increase is likely, especially in the Asia region outside of South Korea. The focus will be to optimize the production processes and facilities.

The total number of professional service robots sold in 2011 rose to 16,408 units, an increase of 9% compared to 2011, with the sales value up 6% to $3.6 billion. Service robots in defense applications accounted for approximately 40% of the total number of service robots for professional use sold in 2011 with the unmanned aerial vehicles (i.e. drones) as the most important application, followed by field robots – mainly milking robots – accounting for 31% of the total supply of professional service robots. Sales of medical robots increased by 13% compared to 2010, accounting for only a 6% share of the total unit sales, but these are expected to witness a considerable growth on the back of the need to reduce the heavy financial burdens of national healthcare systems. The most important applications are robot-assisted surgery and therapy which registered the highest growth rates, while assistive robots for the disabled have not had the expected development. Another important category within the service robotics is the logistics systems (courier and mailing factory logistic systems) which accounts for 13% of the total sales of professional service robots. Logistics systems, as with Medical robots, are expected to have

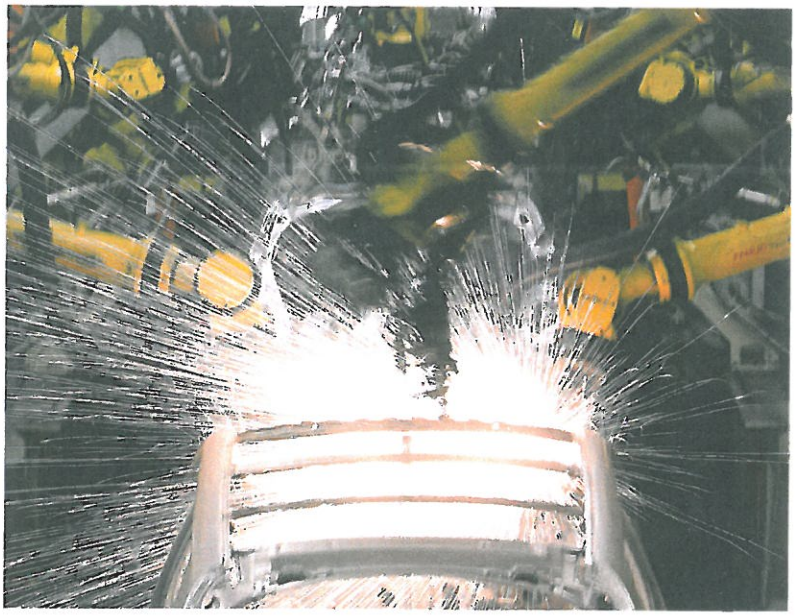
considerable growth potential, especially the sub-segment regarding automated guided vehicles.

In reference to projections for the period 2012-2015, sales forecasts indicate an increase to about 93,800 units with a value of $16.3 billion. Among those with the highest short-term growth rates, we find robots for defense and security applications with about 28,000 expected units to be sold in the period 2012-2015, followed by milking robots with an expected 25,000 units. It is projected that sales of all types of robots for domestic tasks could reach an estimated value of $4.8 billion, of which $1.1 billion solely in the US market, with the market for assistive robotics that will grow much faster in the long run than the other service robots.

Against the backdrop of an aging population and greater healthcare needs, it is necessary to accelerate the development of assistive robotics (a sub-category of service robots) for elder- and disabled-care services. A Dutch survey, commissioned by the EU, concluded that assistive robotics will be able to reduce public health service provisions by about 30% with a 95% probability of returning its own cost of investment.

Service robots will prove very beneficial to all the national healthcare service providers in the world as these will allow for significant cost-savings to the communities as well as performance improvements. Case in point is the use of medical robots to assist surgeons in surgeries that would prove beyond the capabilities of the human hand, taking into account the absolute precision of a machine; or the delivery of caregiver services to the elderly, disabled, or patients within their homes and institutional settings; not to mention the not-so-distant possibility of creating new human artificial organs (robots in all respects and purposes) to replace the heart, liver, kidneys, lungs, thereby reducing complications of organ rejection.

Hence, on the one hand, improvements to the operational efficiency of production processes and facilities, and on the other, improvements to the provision of services useful to the well-being of humans. Unfortunately, the data and statistics bring out a number of other considerations which turn our attentions to a difficult aspect of the current automation process: What will be the importance and incidence of the human workforce in 15 to 20 years' time? How difficult will it be to re-insert into the workforce the millions of workers laid off from the manufacturing lines? Will countries like the US, Japan, and Germany be able to transform and improve their production processes to beat the low-wage competition of the Asian countries before these too adopt automation processes? Will the Asian countries, with China at the forefront, be able to manage the transition to automated services without incurring severe social tensions stemming from the replacement of former farmers-turned-factory workers now displaced by machines?



CHRISTOPHER FURLONG/GETTY IMAGES

Robotic arms assemble and weld the body shell of a Nissan car on the production line at Nissan's Sunderland plant in Sunderland, England, January 24, 2013.

These are difficult questions that pose intertwining challenges.

The race for automation supremacy will surely be contested by countries such as the US, Japan, China, and a few others.

In Europe, during these years of profound crisis, there has been much talk regarding jobs, youth unemployment and future prospects. It is necessary to ensure that governments channel resources to sectors, such as R&D, which are the backbone of high value-added services (the engineers who design and innovate robot technology) and/or with elevated creative content that cannot be replicated by machines. The style, design, quality, business development, organization, planning and engineering, energy efficiency, the construction of first-class infrastructure works, public incentives and pro-corporate policies to prevent the relocation of production sites and facilities in order to provide sufficient time to form a new category of skilled workers. These will be the future drivers of employment growth and consistent with the development of robots and smart technologies. This will be the challenge of current and incoming governments over the course of the next ten years.

In this daring and taxing process, there will surely be a winner: the companies that design and produce robots.

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