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## **The Status of Intelligent Robotics Industry Development in Taiwan**

### **(I) Supply & Demand**

The local intelligent robotics industry output value reached NT\$24.2 billion in 2007, comprising a 5.57% share of the global market. As the future of the service robotics industry looks promising, the Taiwanese government has designated it as a next-generation industry and included it in the “Promotion plan for enlarging investment in emerging industries,” which will invest NT\$2 billion in the industry over the next five years. Through new product development and industry technology projects, assistance for the implementation of development within the industry, and the compilation of the “Strategy for Intelligent Robotics Industry Development and Applications,” the Taiwanese authorities have divided robotics industry development into three stages, for which the final goal is to make Taiwan an international manufacturing center for intelligent robotics.

#### **Strategies for Intelligent Robotics Industry Development and Application**

<b>Stages</b>	<b>Period</b>	<b>Industry development objectives</b>
Stage 1	2005~2008	Industry value is expected to reach NT\$30 billion, with development aimed at constructing an industrial environment. Promotional goals include creating a market and expanding the scope of superior industries, and product development will emphasize tour guide services, recreation and entertainment, in-home services, and industrial manufacturing.
Stage 2	2009~2013	Industry value is expected to reach over NT\$90 billion, with development aimed at industry expansion. Promotional goals include market expansion and large-scale industry development, and product development will emphasize

		public services and in-home care.
Stage 3	2014~2020	Taiwan becomes a global intelligent robotics manufacturing center, with development aimed at locking on to niche markets. Promotions will emphasize lifestyle intelligence and entering the global market, and product development will emphasize unique services and medical assistance tools.

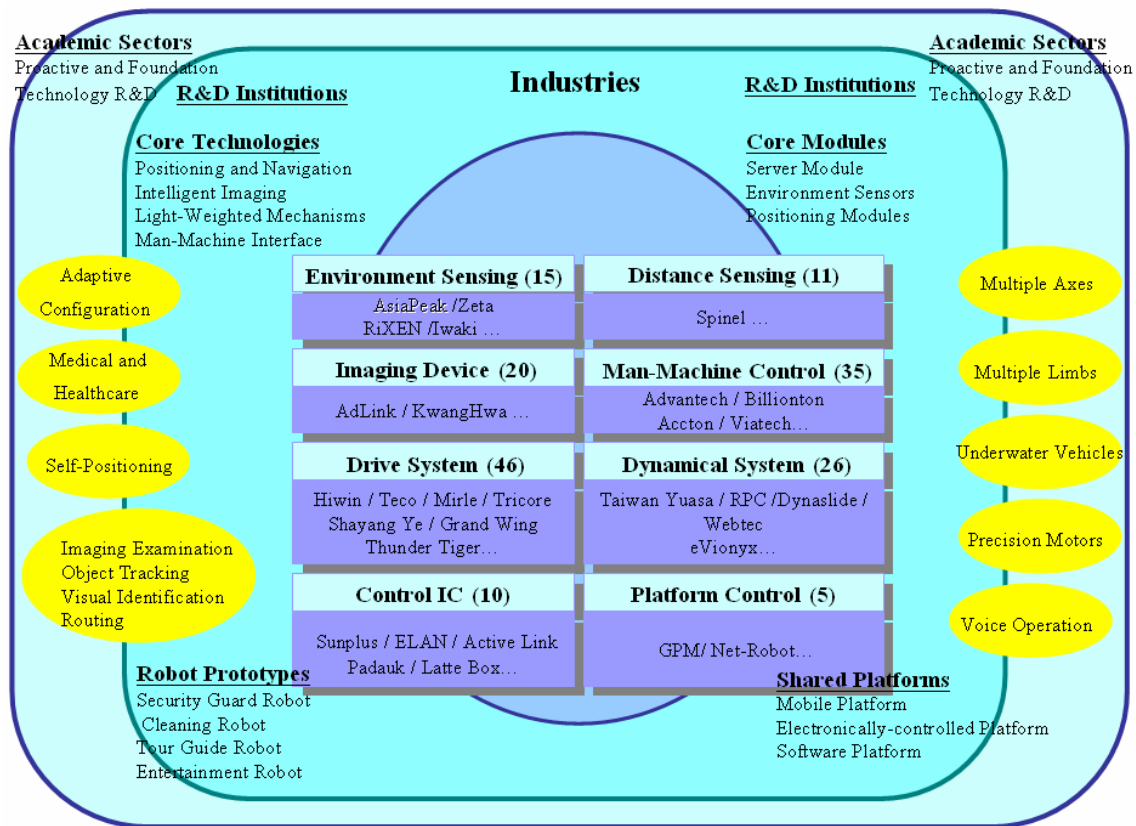
Source: Ministry of Economics Affairs

## **(II) An Analysis of Existing Gaps in the Industry Supply Chain, Investment Niches, and Prospective Foreign Investors**

The purpose of intelligent robotics is mainly to combine various components with system modules, focusing on integration. An intelligent robotics industry chain is gradually forming in Taiwan, with local enterprises getting involved in fields including environment sensors, distance sensors, imaging devices, human-machine interface, system drivers, power systems, control chips, and platform controls.

However, high technological thresholds in the fields of key technologies, key modules, shared platforms, and robotic prototypes means that related technologies and the patents for key components are mostly owned by foreign companies. The rate of product commercialization remains low; therefore, the focus must be on how to help local companies reduce costs. Figuring out how to attract foreign companies to invest in intelligent robotics in Taiwan and how to increase industry scale and output value will, therefore, be the key to intelligent robotics industry development on the island.

## The Intelligent Robotics Industry Supply Chain in Taiwan



Source: Industrial Development Bureau, Ministry of Economic Affairs

The demand for service robots increases with the growing trend of aging populations and low birth rates. In view of this, the Taiwanese government has designated service robots as a key next-generation industry and made investments in projects to assist the development of key components and product commercialization. In addition, the establishment of R&D alliances could further promote product exploration; industry companies could make use of government resources to reduce risks and enhance competitiveness.

In addition to helping the industry develop products and form R&D alliances, the rapid development of precision machinery, information electronics, AI software, mechatronics control integration, and the Internet in recent years has brought universities in Taiwan into the field of intelligent

robotics R&D, which in turn is nurturing a large number of qualified persons to supply the future human resource needs of the industry.

An analysis of foreign business shows that there is great potential in companies such as iRobot, Electrolux, Computer Motion, and Intuitive Surgical. In 2005, iRobot launched the “Scooba” housework robot for dusting, washing, and drying floors; Electrolux’s “Trilobite” is an automatic vacuum cleaner which calculates the cleaning time required based on the size of the room. Control systems companies include Evolution Robotics and Microchip. Evolution Robotics has made a breakthrough in application by embedding mobile phones and interactive toys with robotics technology; and Microchip has created an integrated robotics system with its PICmicro system micro-controller, RTOS, and AI technology. In other areas, Moli Energy specializes in system drivers while Evolution Robotics is the authority on software operating systems. At present, a good positioning system is the most important thing for home service, tour guide, and security robots, and the positioning and mapping software created by Evolution Robotics has great development potential.

The intelligent robotics industry is just taking off. With the advantages of competence in product commercialization and cost control, and a complete precision machinery and ICT industry chain, Taiwan has what it takes to develop its intelligent robotics industry. Beyond the cooperative efforts of government, industry, and academia, technological cooperation and strategic partnerships with foreign companies can be combined with Taiwan’s manufacturing capabilities to generate enormous output value and business opportunities.

### **(III) Major Suppliers in Taiwan**

The current focus of the robotics industry in Taiwan is mainly on industrial robotics, but it will gradually shift to service robotics in the future. The X-Y Table and cartesian coordinates robots produced by Apex, Hiwin, and Alfarrobot are ready for export to China and Japan. In the future, Taiwan will move towards the development of home service robots. Current investors in intelligent service robotics research are mainly major IT manufacturers including Mircostar, BenQ, VIA technologies, Quanta, Mirle, and Teco. At present, Microstar has developed a humanoid robot prototype, Shin Kong Security Co. has introduced a new Shin Kong SeQ-2 security robot, and Teco has jumped into the market with motors and servers.

Noting the trend in service robotics, security operator Shin Kong Security cooperated with the Industrial Technology Research Institute (ITRI) to develop the SeQ-1 robot; this robot has formally joined the national security system, and is now charged with the important duty of safeguarding the safety, life, and property of the people of Taiwan. SeQ-1 is an ITRI innovation which integrates ITRI's novel environment security system into the robotics platform, thereby empowering the robot with interactive real time and security monitoring capabilities.

With regards to technical toys, in addition to traditional components and contract manufacturers, taking the field are other basic components manufacturers such as Shayang Ye for server motors, Tricore for small motors, high-quality IC and sensor providers such as Winbond, Elan, Sonix, and Generalplus, and assemblers such as Hon Hai and Active Link. Although most of these companies are now still focused on OEM components, seldom release new branded products, and concentrate most development efforts on IC manufacturing, their involvement nevertheless goes to show that the

technical toy industry is gradually attracting interest, ensuring that more and more Taiwanese manufacturers will join the market in future.

Experts and scholars in the mechanical and agricultural fields have also exerted much effort in relevant research areas—such as research into applications and technological development for greenhouse cultivation and precision agriculture undertaken by the National Taiwan University (NTU) Department of Mechanical Engineering and Department of Agricultural Engineering. In addition to academic research, ITRI has also devoted much manpower to the manufacturing of automated-control vehicles, and has applied research results to the delivery of office articles and packages. The scope of industrial logistics and transportation is mostly limited to conventional non-rail type guidance methods such as optics and waves; non-rail guidance methods are not yet popular.