

Press Release

Major Findings of the New Report on
Markets, Strategies, Technologies

Sensors Markets 2016

Development of Sensors Markets for the Non-Military, Open World Market until 2016

Annual growth of non-military world market for sensors: 7.9% between 2006 and 2011, and forecasted to be 9.1% between 2011 and 2016.

2006:	EUR 81.6 billion
2011:	EUR 119.4 billion
2016:	EUR 184.1 billion

Markets: In 2016, highest demand for sensors will be in the information and communication industry as well as the vehicle industry, followed by the building sector, medical sector and process industries.

Countries: Highest sensors demand for machinery in Germany and Japan, followed by the USA. USA main driver for innovation and strongest market for sensors in the information/communication technologies as well as leading sensors market for process industries. China, India, and Southeast Asia catching up rapidly.

Trends: Worldwide growth of sensors markets accelerated by further advance of automation in production processes. Rapid growth of comfort and safety electronics plus a trend towards driver assistance systems as well as hybrid electric vehicles and electric cars stimulate growth of sensors in the vehicle industry. Increasing demand for gas and biosensors in medicine.

Sensors: Digitization, smartness, and communication capability as innovation drivers for sensors. Image sensors, cameras, pointing sensors, MEMS and fiber-optic sensors booming.

2011–2016: Dynamic Growth of Global Sensors Markets

The **non-military, open market** for sensors grew from EUR 81.6 billion in 2006 to EUR 119.4 billion in 2011 and can be expected to grow to EUR 184.1 billion until 2016, according to the new World Report just published by INTECHNO CONSULTING, Basel (Switzerland). This corresponds to an average annual growth rate of 7.9% between 2006 and 2011, and 9.0% between 2011 and 2016. The average annual growth rate for the entire period covered is 8.5%. These are just some of the results of the new World Report, “**Sensors Markets 2016**” by INTECHNO CONSULTING, Basel.

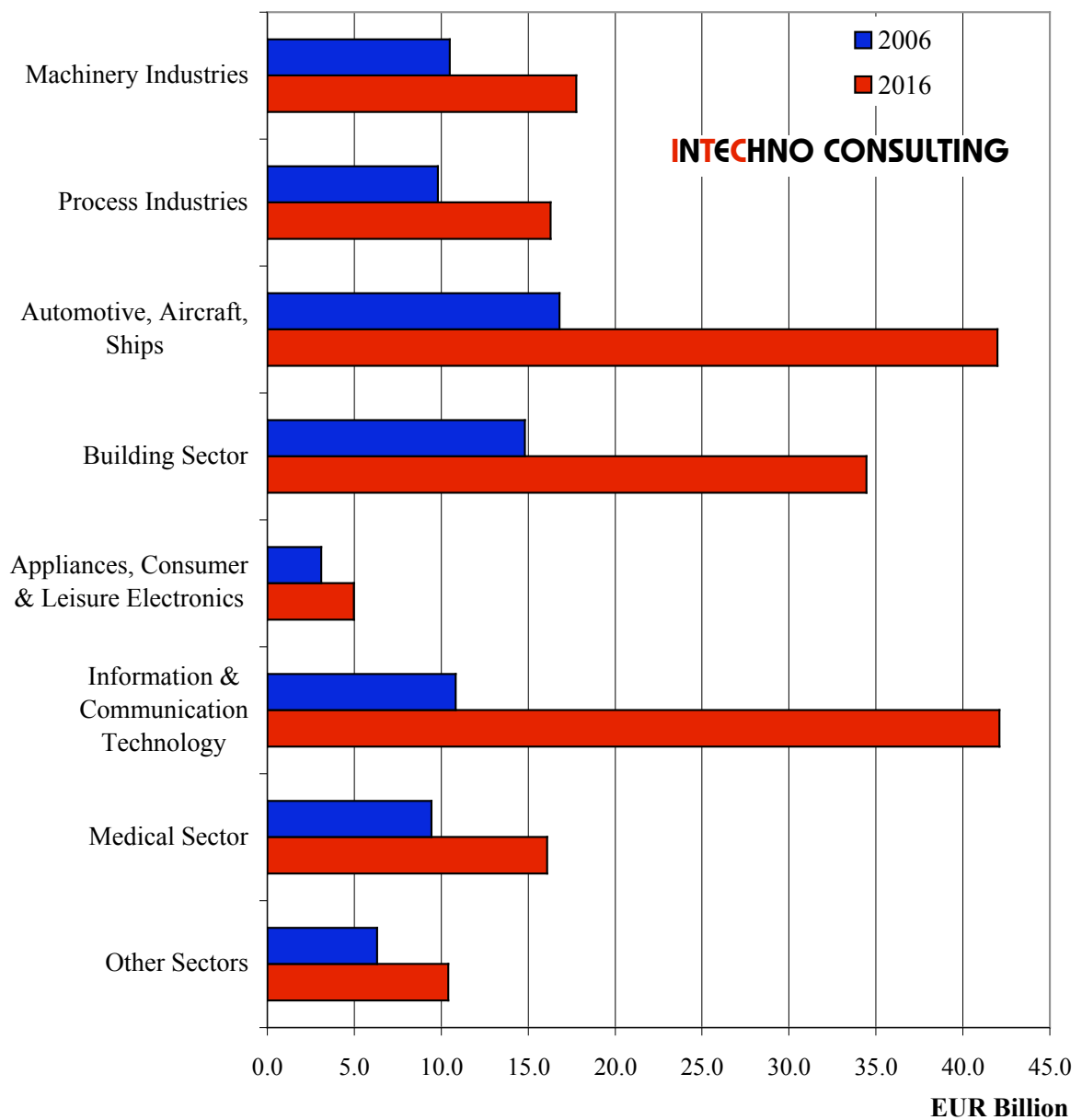
Contrary to earlier INTECHNO Sensor Reports, the market figures and forecasts of the new Report include not only conventional sensors like pressure, temperature, level, flow, and position sensors, but also unconventional types of sensors. Some of these are pointing sensors like touchscreens and touchpads, barcode readers and RFID readers for identification purposes, but also remote-readout and intelligent power meters, gas and water meters, as well as remote-readout heat meters. This World Report covers a total of 49 sensor types, analyzed and forecasted according to applications, countries, and underlying measurement principles.

For the machinery sector alone, the sensors requirements of 500 types of machines have been analyzed and forecasted by means of extensive and detailed model calculations. In the process industries, more than 100 subsectors have been screened and evaluated for their sensor demand. As for the medical sector, the need for sensors has been assessed for more than 90 areas of application. However, the Report publishes only the aggregated figures for each subsegment. The study has been conducted for 80 countries; and the Report specifically shows the developments in the USA, Japan, China, Germany, France, the UK, Italy and the other Western European countries. The facts and figures of this 1,520-page Report are based on and validated by numerous expert interviews as well as extensive and detailed model calculations for all segments.

Of the EUR 119.4 billion worldwide sensors demand in 2011, 8.7% were for purely binary sensors; 32.9% for sensors measuring mechanical properties; 8.5% for sensors measuring thermal conditions; 2.1% for sensors measuring optical properties; 2.7% for sensors measuring electrical properties; and 19.2% for image sensors and cameras of all types.

A particular focus of this Report is on image sensors, camera modules, and cameras—distinguishing between optical cameras for the visible range, infrared cameras, UV cameras, ultrasonic image sensors, and capacitive image sensors. Another new category in this Report is that of sensors measuring quality properties, whose world market share in 2011 was around 0.8%. That year, the share of sensors measuring chemical and biological properties in the world market for sensors was 10.9%.

Figure 1:
Analysis and Forecast of the Non-Military, Open World Market for Sensors until 2016: Subdivision by Major Industries



From the perspective of sensor manufacturers as well as potential investors, the growth rates stated above are rather conservative, since the price decline to be expected for most of these sensors is already factored in. Thus these market figures are based on current prices. The corresponding growth rates are nominal rates. Demand spikes triggered by new, as yet unknown applications might very well boost growth by another 1% between 2011 and 2016.

World Market for Sensors: Industries/Applications

Sensors pervade their existing industries and application sectors more and more, and they constantly open up new fields of application. Production technologies, modern vehicles, innovative medical devices, smart power supply systems and building technologies are nowadays inconceivable without sensors. At the same time, sensors continue to improve in quality, they are more specific and robust, often smarter and more communicative and yet they are less expensive than their predecessor generations. Sensors are found in almost all spheres of life today. Furthermore, with the ongoing boom of smart mobile communication technology and tablet PCs, the need for sensors is rising dramatically. Hi-tech corporations are already researching novel types of sensors for these applications. Mobile phones with face recognition are just around the corner. Cell phones with integrated spectrometers to measure food freshness are no longer inconceivable, even though at present they seem a rather long way off.

Figure 1 gives an overview of the development of the worldwide sensors markets in aggregated **industries/application sectors**. Of the EUR 81.6 billion global demand for sensors in 2006, 12.9% came from the machinery industries, 12.0% from the process industries, and 20.6% from all vehicle industries including airplanes, ships and rail vehicles. Around 18.2% of the total demand came from the building sector, 3.8% from manufacturers of household appliances and consumer electronics, and 13.3% from the sector of information and communication technology.

Of the EUR 184.4 billion EUR global market for sensors in 2016 forecasted by INTECHNO, 9.7% will go to the machinery industries, 8.9% to the process industries, and 22.8% to the vehicle industries including airplanes, ships and rail vehicles. Around 18.1% of the total demand is predicted for the building sector, 2.7% for household appliances and consumer electronics, and as much as 22.9% for information and communication technologies with their devices, systems and networks. Medical technology is predicted to have a share of 8.8% in the total market.

Moreover, growing demand for sensors will come from the environmental sector, research and development, and the infrastructure sector. This last sector includes, among others, oil and gas pipelines as well as electricity transmission and distribution networks. The trend towards smart networks boosts demand for smart power meters as well as current and voltage sensors.

Market Development: Regions

Figure 2 gives an overview of the development of the non-military world market for sensors in individual **regions**. The EUR 119.4 billion global demand for sensor elements, sensor modules, sensors and sensor systems in 2011 was distributed among the regions as follows:

- Western Europe: 31.8%;
- Eastern Europe: 2.8%;
- North America: 28.3%;
- South America: 1.7%;
- Asia-Pacific: 34.4%;
- Rest of the World: 1.0%.

These figures and **Figure 2** illustrate that Western Europe is losing significant market shares, in spite of Germany's strong overall position in the sensors market. The main reason for this is the fact that Western European sensor buyers are found mostly in the established industries, while the USA and Japan lead in information and communication technology—the main growth sector for the future sensors markets.

Note, however, that in the Report, the sensors demand of foreign subsidiaries is generally attributed to their foreign locations, although the purchasing decision and the specification of the sensors to be bought are generally made in the country of the parent enterprise. Since, for instance, German automobile firms have a great part of their vehicle production abroad, the German market share—in the sense of decisions to buy—is higher than shown in the Report. High market share growth is observed for China, Southeast Asia, and India.

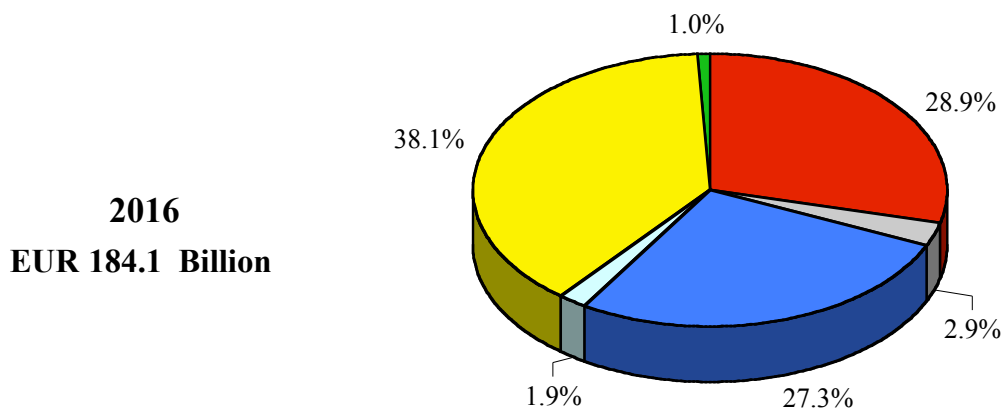
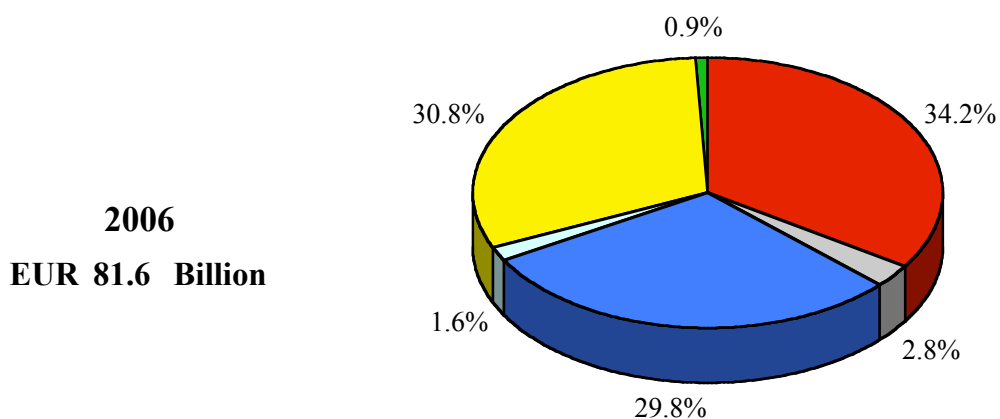
Technological Developments

Sensors with digital output signals are in the process of replacing sensors with analog output signals. Bus enabled sensors with wireless communication are on the rise, especially in building technology. However, their importance also rises in the process industries, for instance in remotely distributed plant locations as well as for condition-based monitoring of rotating machinery. These wireless sensors generally require batteries; but in the future, “energy harvesting” will increasingly eliminate this need. According to this concept, energy is taken directly from the sensors' environment (ambient motion conversion, thermoelectric conversion, vibration energy and photoelectric conversion).

“Wearable” sensors (woven into textiles) are another technology of the future, as well as distributed optical fiber sensors that monitor bridges and underground oil reservoirs. Optical cameras show a trend towards 3D sensors and will operate with various types of sensor technologies. Apart from numerous industrial applications, the market for image

Figure 2:
 Analysis and Forecast of the Non-Military Open World Market for Sensors until 2016: Subdivision by Regions

INTECHNO CONSULTING



- Western Europe
- Eastern Europe
- North America
- South America
- Asia-Pacific
- Rest of the World

sensors and cameras will be boosted, primarily, by driver assistance systems in vehicle construction and, increasingly, by consumer and communication electronics.

Sensors for harsh environments and heavy-duty conditions are needed primarily in the process industries and in general machinery. Robust housing concepts and innovative solutions are of the essence here.

Absolute position sensors show a trend towards non-contact sensors. In navigation and inertial sensors like gyro sensors, the development is towards two and three axes devices. Sensors for inertial navigation show a development towards MEMS-based inertial measuring units (IMUs) with six axes. Magnetic compasses and GPS chips continue to gain importance in vehicle construction as well as in mobile phones and other handheld devices. Smart noses and smart tongues, although still a market of the future, are already being used in some cases for quality control, e.g., for systematic analysis and evaluation of flavors in the food and flavor industries. Moreover, medication via sensor activated microchip implants may well be an option in the future. Camera sensors (camera pills) that can travel through the gastrointestinal tract are already a reality.

Due to the enormous variety of sensors, measurement principles, and applications, the information given above offers no more than a concise selection of examples.

Success Factors

Success comes in many forms. Apple Inc. could be a model for some sensor makers: simple and uniform handling, uniform design, customer benefit, and all this with an extremely smart service concept. Hardware, software and services practically interlock. Innovation is the key to growth, and sensors are no exception from this. The pursuit of more and more convenience and functionality features in a world of electronics that is becoming increasingly complex by the day, is a driving force for innovation. In digital sensors with communication capabilities, plug-and-play concepts are an advantage. Smart sensors that monitor their own functionality in addition to that of the machines are up and coming.

With accelerating product cycles, more innovation is key to coming out on top of the competition and reaching growth targets. This requires strategic innovation management and a new culture of innovation in the enterprise. Generating breakthrough ideas—as a rule, the beginning of the innovation chain—should not be left to chance. Ideas need to be managed. Innovative ideas often simply pop up, but their management should be systematic and strategy-oriented. Research by “crowd sourcing” could be a new, very efficient and, at the same time, cost-effective approach to systematic generation of ideas within a strategic framework. This approach involves external partners in internal processes of an enterprise in order to generate innovative ideas. Translating these ideas into marketable products and services is the job of the innovation managers.

However, the conventional mechanism of innovation should not be neglected but strengthened: All information that comes from direct customer contact and is relevant for innovation, should be evaluated systematically and communicated to the R&D department within the enterprise. Modularity is key to being able to offer business-specific and individual solutions at competitive prices. It would be ideal to offer sensors with application or even customer-specific features that could be adjusted by software instead of hardware means.

Developing roadmaps is another promising approach within strategic marketing. It enables targeted and efficient market introduction of new technologies. However, the starting point should be a vision of the future and/or several possible futures. The core questions are: Where do we want to be? Why do we want to be there? How do we get there? What is the current situation, where do we stand at present? Developing scenarios can help, too. Alternative scenarios in international demand as well as in supply chains, however, are a must for any strategy. Worst-case scenarios should also be worked out, so that crises can be weathered. However, in all strategic deliberations, it is important never to forget that keeping and satisfying one existing key customer is always more profitable and cost-effective than winning two new ones. This goal can be reached, above all, by close and trusting cooperation.

**SENSORS MARKETS 2016:
Worldwide Analyses and Forecasts of Sensors Markets until 2016**

*World Report available from INTECHNO CONSULTING,
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