



# **Market Research Report Industrial Camera & Imaging**

Contents

- 1. Introduction ..... 4
- 2. Market Overview ..... 8
  - 2.1. Market Forecast..... 9
  - 2.2. COVID-19 Impact..... 9
- 3. Key Market Trends ..... 12
  - 2.3. Technology Trend ..... 12
- 4. Market Drivers ..... 15
  - 4.1. Growth..... 15
  - 4.2. Opportunities..... 15
  - 4.3. Restraints..... 15
- 5. Market Segmentation ..... 18
  - 4.4. By Type ..... 18
  - 4.5. By Chip ..... 19
  - 4.6. By Camera Sensor ..... 20
  - 4.7. By Application ..... 21
  - 4.8. By Distribution Channel..... 22



# Introduction

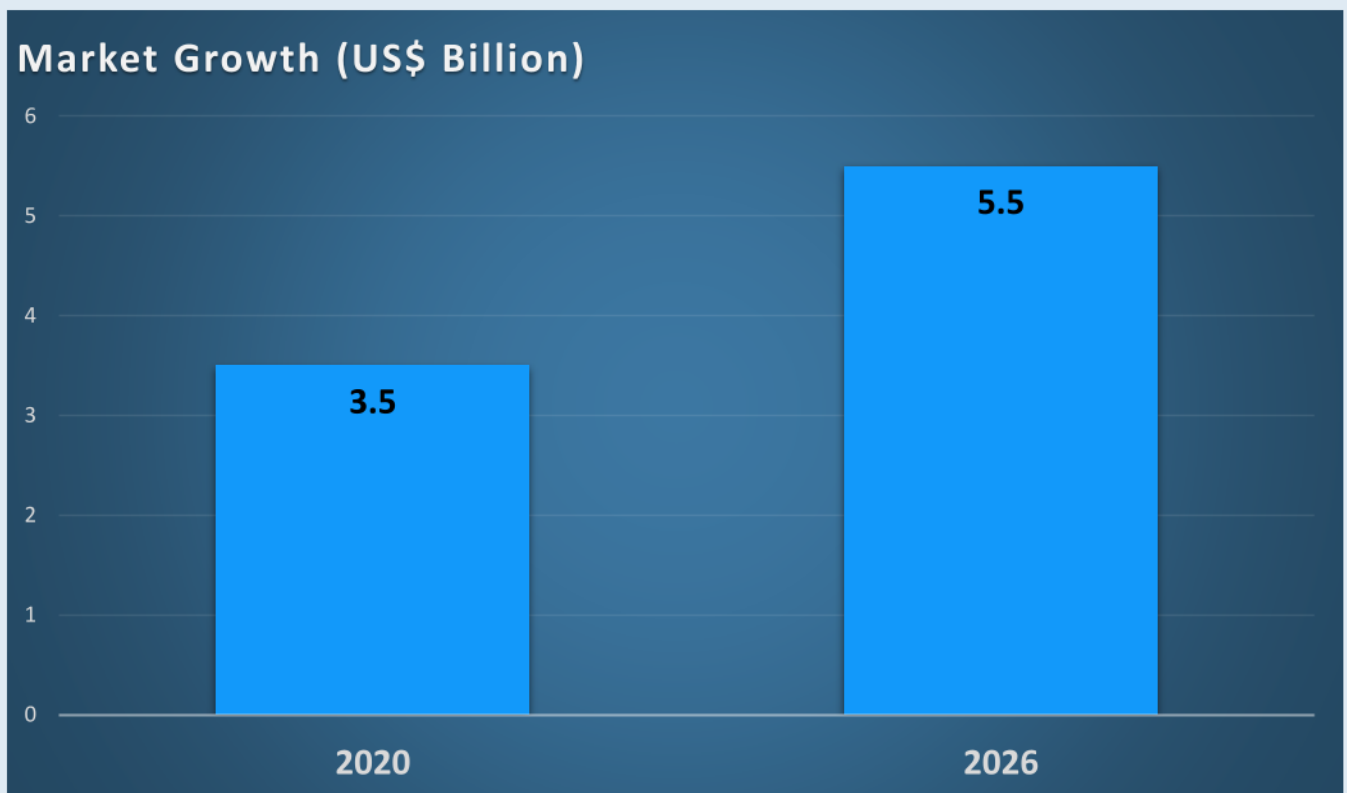
## 1. Introduction

In the Age of Automation and the Smart Factory, classic machine vision is the cornerstone of success for the Imaging industry. CMOS technology and fast processing are enabling real-time precision, while cognitive vision solutions using artificial intelligence are the bases for further growth. Customized embedded vision is expanding into a wider range of industries and innovative applications, boosting their performance and efficiency. Integrated image processing, which provides a combination of reliability, superior quality, and a high level of innovation, is now a basic building block in the digitally networked world.

Automation in production and agriculture, like in the last five years, is the main imaging field according to both manufacturers and users. Quality assurance is the top camera application for both manufacturers (72%) and users (49%), followed by Opto-sensory measurement tasks (62% and 48%, for manufacturers and users, respectively). Also, robotics and scientific applications still represent an important part in the total imaging sales and purchase decisions, as outlined by the responders of this survey. Manufacturers reported 115% growth in the transportation sector compared to 2018, driven by autonomous vehicles and assistance systems applications.

- ▶ The industries across the domains globally are moving towards automation by adopting advanced technologies for more efficient operations and processes. The manufacturing industries have been using cameras for decades for quality assurance, but with the advancements and AI, the applications range widened for inspection, measurement, and microscopy. The growing implementation of advanced technologies across industries are driving the market of machine vision camera.
- ▶ The adoption has gained traction in real-time traffic counting with machine vision, and image recognition enables the automation of control room work and preventive intervention in situations. The companies offering machine vision cameras are experiencing significant growth in recent years due to the increasing demand for such products.

- ▶ However, the lack of skilled labor and inconsistency in demand and requirements from the industries limit the growth of the market to an extent.
- ▶ The demand for machine vision cameras is expected to see a steady growth rate in the region owing to the growing end-user industries. In the automotive sector specifically, the increasing investments in the region coupled with the growth in investments related to e-vehicles are further expected to propel the machine vision camera market. For instance, General Motors has invested USD 2.8 billion as a new investment in South Korea in 2018 over the next ten years as part of its plan to restructure its embattled unit in the country.



As analyzed by Yole's team in the new Machine Vision for Industry and Automation 2021 report, Yole estimates that CIS now accounts for over 86% of the industrial camera market. The development of other imaging modalities such as 3D technology and multi-spectral imaging in industrial cameras promotes diversification in the application of machine vision in the industry, the penetration of new technologies will therefore increase further. In a virtuous circle scenario, the applications for machine vision products are becoming more extensive. This behind-the-scenes technology further promotes the

overall development of consumer electronics manufacturing, automotive manufacturing, and other manufacturing industries, while improving manufacturing accuracy, meaning that the demand for machine vision technology will continue to increase. Each country and region's upgrading of industry, including Industry 4.0, will greatly accelerate the development of automation and promote the development of machine vision.





# Market Overview

## 2. Market Overview

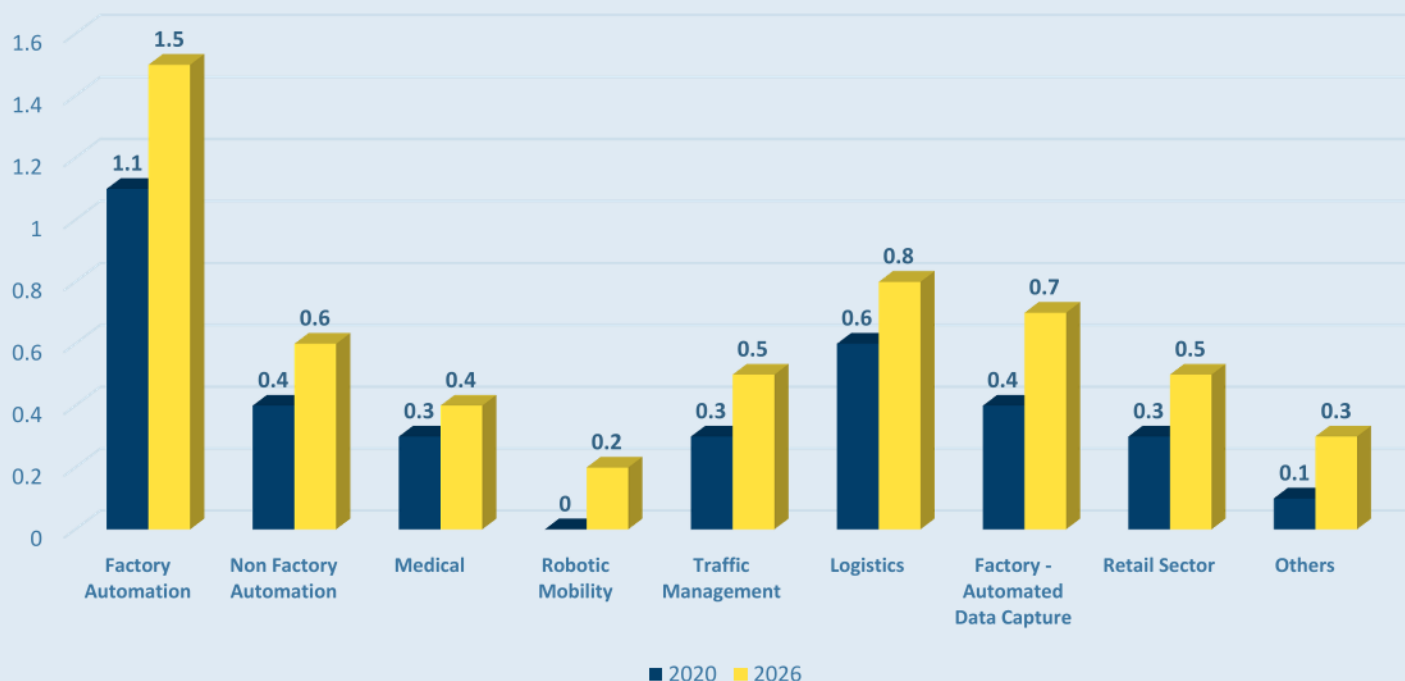
The market for industrial and automation cameras will have a steady growth over 2020 to 2026 with robotic mobility with the highest potential of growth with a compound annual growth rate (CAGR) of 43 percent. However, factory automation will remain one of the largest market segments with a forecast of 1.5 billion U.S. dollars for 2026. The overall market is set to grow at a CAGR of 7.4 percent between 2020 and 2026.

Factory automation is the highest growing market for an industrial camera, automation, and imaging market with a market size of \$1.10 bn in the year 2020 and expected to rise to \$1.50 by the end of the year 2026.

Sector	2020	2026
Factory Automation	\$ 1.10	\$ 1.50
Non-Factory Automation	\$ 0.40	\$ 0.60
Medical	\$ 0.30	\$ 0.40
Robotic Mobility	\$ -	\$ 0.20
Traffic Management	\$ 0.30	\$ 0.50
Logistics	\$ 0.60	\$ 0.80
Factory - Automated Data Capture	\$ 0.40	\$ 0.70
Retail Sector	\$ 0.30	\$ 0.50
Others	\$ 0.10	\$ 0.30



## Industrial and Automation Camera Market Size in North America and EU (in Billion U.S. Dollars)



### 2.1. Market Forecast

- ▶ The global industrial and automation camera market expands to US\$5.5 billion in 2026, at 7.4% CAGR.
- ▶ Yole's forecast is for 5.0 million units of MV cameras in 2026.
- ▶ Yole's forecast is for about 26.9 million units of ADC camera modules in 2026.

### 2.2. COVID-19 Impact

The COVID-19 pandemic accelerated e-commerce dominance which heavily relies on logistic automation. In the context of robotization of industrial and logistic processes vision-guided robots also have a card to play. Be the inspection, counting, positioning, or picking, for example, a rising impulse for their adoption leads the robotic industry and the subsequent machine vision market to even further heights.

Autonomous vehicles are capable of sensing their environment and operating without human involvement. And that's not just passenger cars, but other autonomous vehicles, such as logistics trucks, and all kinds of autonomous moving tools that require multiple vision cameras to recognize surrounding objects. These products are driven by machines instead of human beings, which will be revolutionary and will further develop the market for machine vision. It is estimated that the cameras in this area will become a significant segment reaching US\$211 million in 2026 with a CAGR of 43%.



# MARKET TRENDS

### 3. Key Market Trends

The automotive industry is transforming rapidly with the autonomous vehicle and automation within the manufacturing plant itself. According to Goldman Sachs, in the ten years, the revenue of ADAS/AV is expected to witness a CAGR of 42% to reach USD 197 billion by 2030.

With continuous technological advancement, the adoption of a machine vision camera has increased for the application of autonomous vehicles, including parking cameras, CMS cameras for side view, SVS cameras for a 360-degree view around the car. The increasing penetration of ADAS and autonomous vehicles across the world is expected to drive the market the machine vision cameras.

Further, the machine vision cameras are used in the automotive manufacturing process, including inspection, and for measurement in research and development of new parts. These applications use a barcode scanner, 3D imaging cameras, line scan cameras, etc.

Goldman Sachs has also stated that the camera segment has the potential to reach a market size of over USD 28 billion for automotive vehicle component suppliers.

Many automotive companies are also expanding their production capacity and presence internationally, which will create more demand for machine vision cameras. For instance, in 2018, BMW inaugurated its new manufacturing plant for autonomous electric vehicles in Dingolfing, Lower Bavaria.

#### 2.3. Technology Trend

Industrial vision systems are designed to use information extracted from digital images to automatically guide manufacturing and production operations through cameras:

- ▶ MV continues to shift from PC-based to board cameras and smart cameras
- ▶ Lenses are also evolving as the market gets bigger, and liquid lenses are the next big thing
- ▶ The number of multispectral cameras accounted for nearly 5% of the market in 2020, it will further develop multispectral cameras to meet the needs of the market

- ▶ 3D imaging allows a more complete vision of a product enabling better quality tracking, which could further increase the market share from the current 7% in revenue
- ▶ AI and machine learning (processor) could give machine cameras more power or change the shape of the cameras,
- ▶ 5G communication could accelerate this trend

CMOS image sensor (CIS) is now dominating the industrial vision market, with 92% of market sales, while CCD will continue to decline, and remain in the niche, high-end areas such as medical and defense.

- ▶ Reduction of pixel size shrinking is the underlying trend bringing additional performance
- ▶ Stacking of image sensors over logic IC further accelerates image processing circuits and pixel integration, leading to new types of chips: GS, 3D ToF, Quantum, Event-Based...
- ▶ AI will be the next level of integration



# Market Drivers



## **4. Market Drivers**

### **4.1. Growth**

The growing need for quality automation and inspection, expansion of new connected technologies, and government initiatives to support smart factories is expected to accelerate the demand for industrial cameras during the forecast period. In addition, growing government investment in countries such as India and China to encourage the manufacturing sector is expected to drive the global industrial camera market in the near future. Other than the automotive sector, industrial cameras are expected to have a huge opportunity in the food and packaging sector during the forecast period.

### **4.2. Opportunities**

CMOS (Complementary Metal-Oxide Semiconductor) sensors have established themselves with their groundbreaking sensor technologies as compared to CCD (Charge-Coupled Device) sensors in many areas of industrial image processing. It comes with high resolution, frame rates, and low power consumption, offering an excellent price-performance ratio. The operating principle of CMOS sensor is that it operates on the photoelectric effect, and image sensors convert photons into electrical charge. The main features of CMOS sensors include absolute sensitivity threshold, temporal dark noise, dynamic range, quantum efficiency, maximum Signal-to-Noise ratio, and K-Factor. These factors create new opportunities for the industrial camera market.

### **4.3. Restraints**

Several local players in the market manufacture low-quality industrial cameras at a cheaper price. As a result, major manufacturers face stiff competition from these local players and lose out on the price competency factor. This is expected to hamper the growth of the industrial camera market during the forecast period.

Growth		Opportunities	
<ul style="list-style-type: none"><li>• Growing need for quality automation and expansion of new connected technologies<ul style="list-style-type: none"><li>• Increase in government investment</li></ul></li><li>• Increased demand for the industrial camera market<ul style="list-style-type: none"><li>• Opportunity in the food and packaging sector</li><li>• Augmented reality in the automotive industry</li></ul></li></ul>		<ul style="list-style-type: none"><li>• CMOS technologies are growing more compared to CCD technology<ul style="list-style-type: none"><li>• Opportunities in the food processing market in addition to the automotive sector</li><li>• New opportunities for MV such as robotics and check-out-free retail are emerging</li><li>• The implementation of the Internet of Things (IoT)</li></ul></li></ul>	
Restrains & Challenges			
<ul style="list-style-type: none"><li>• Low quality industrial cameras at a cheaper price</li><li>• Competition being faced by quality producers from the local players</li></ul>			



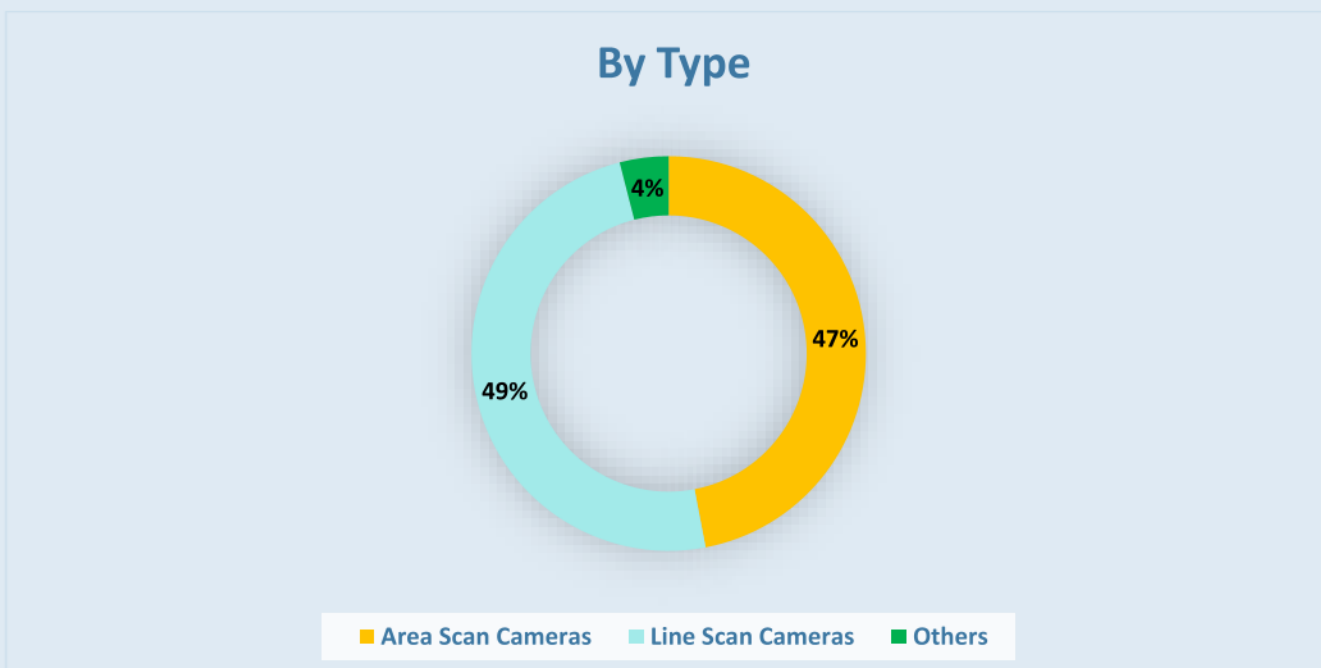
# Market Segmentation

## 5. Market Segmentation

### 4.4. By Type

- ▶ Area Scan Cameras
- ▶ Line Scan Cameras
- ▶ Others

Market Share in % by Type	
By Type	Share
Area Scan Cameras	47%
Line Scan Cameras	49%
Others	4%

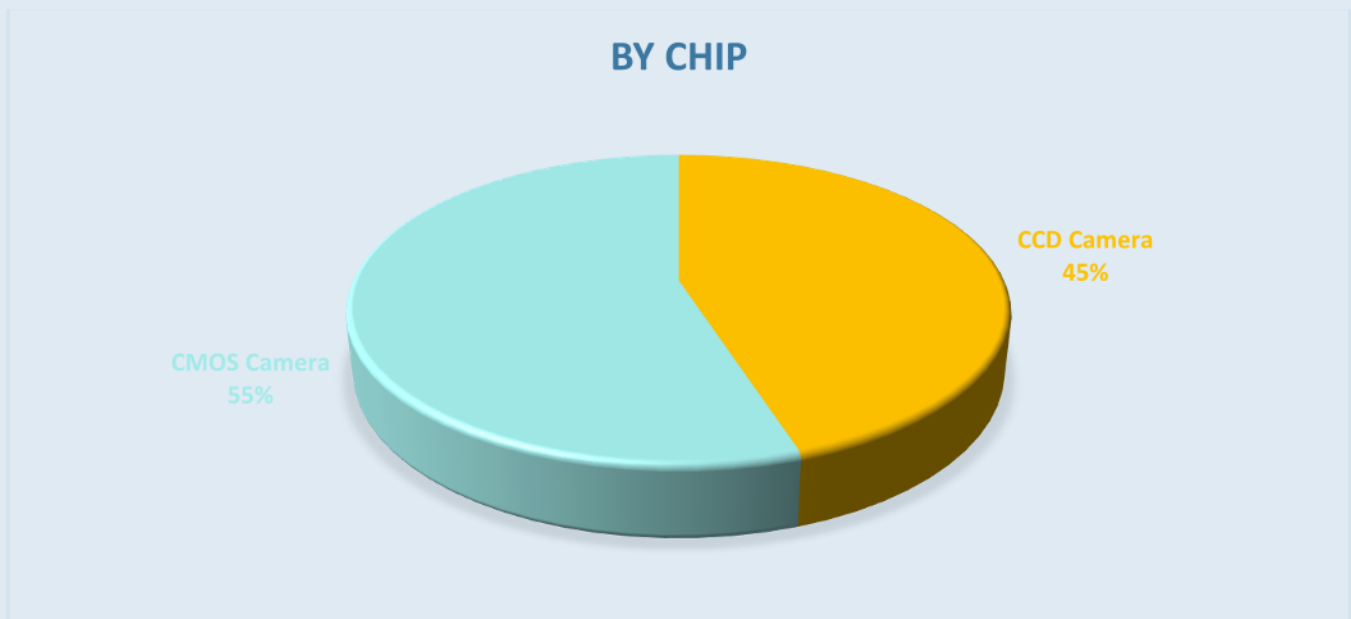


Market Share in US\$ Billion by Type							
By Type	2020	2021	2022	2023	2024	2025	2026
Area Scan Cameras	1.706	1.829	1.961	2.102	2.253	2.415	2.589
Line Scan Cameras	1.779	1.907	2.044	2.191	2.349	2.518	2.699
Others	0.145	0.156	0.167	0.179	0.192	0.206	0.220
Total	3.630	3.891	4.172	4.472	4.794	5.139	5.509

## 4.5. By Chip

- ▶ CCD Camera
- ▶ CMOS Camera

Market Share in % by Type	
By Type	Share
CCD Camera	45%
CMOS Camera	55%

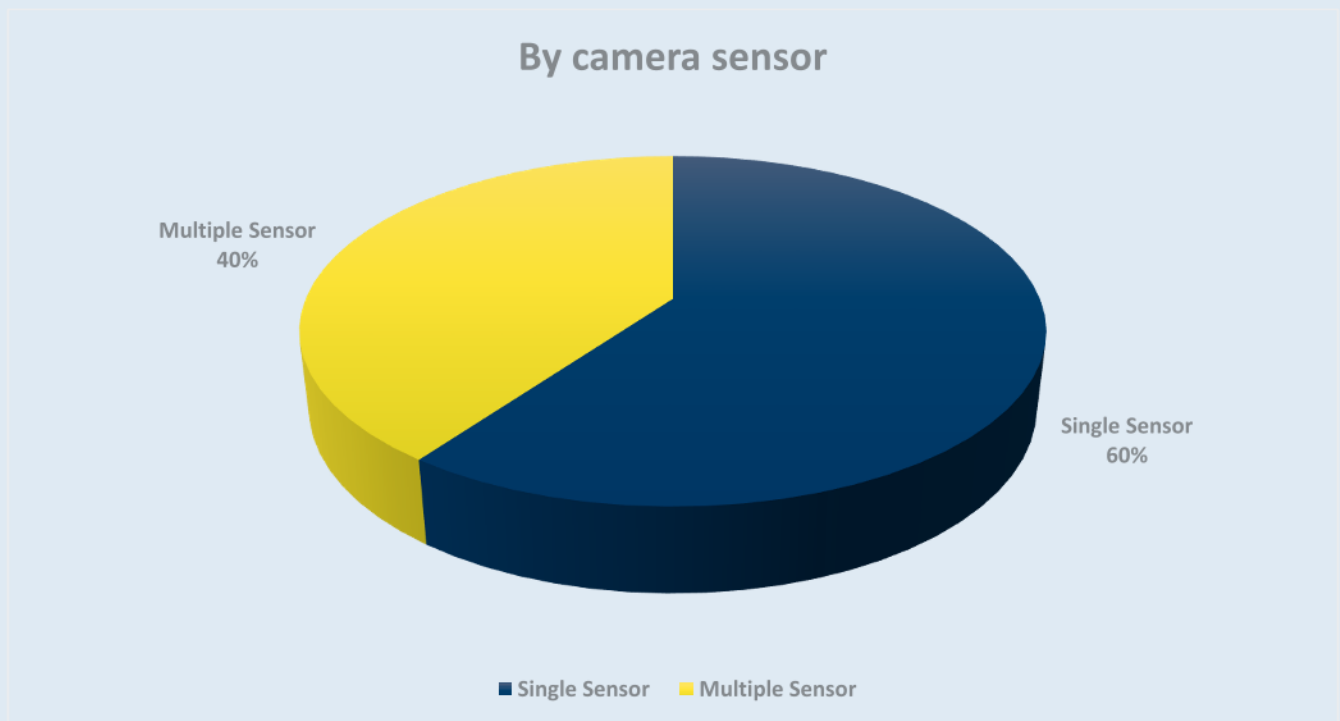


Market Share in US\$ Billion by Chip							
By Type	2020	2021	2022	2023	2024	2025	2026
CCD Camera	1.634	1.751	1.877	2.012	2.157	2.313	2.479
CMOS Camera	1.997	2.140	2.294	2.460	2.637	2.826	3.030
Total	3.630	3.891	4.172	4.472	4.794	5.139	5.509

## 4.6. By Camera Sensor

- ▶ Single Sensor
- ▶ Multiple Sensor

Market Share in % by Type	
By Type	Share
Single Sensor	60%
Multiple Sensor	40%



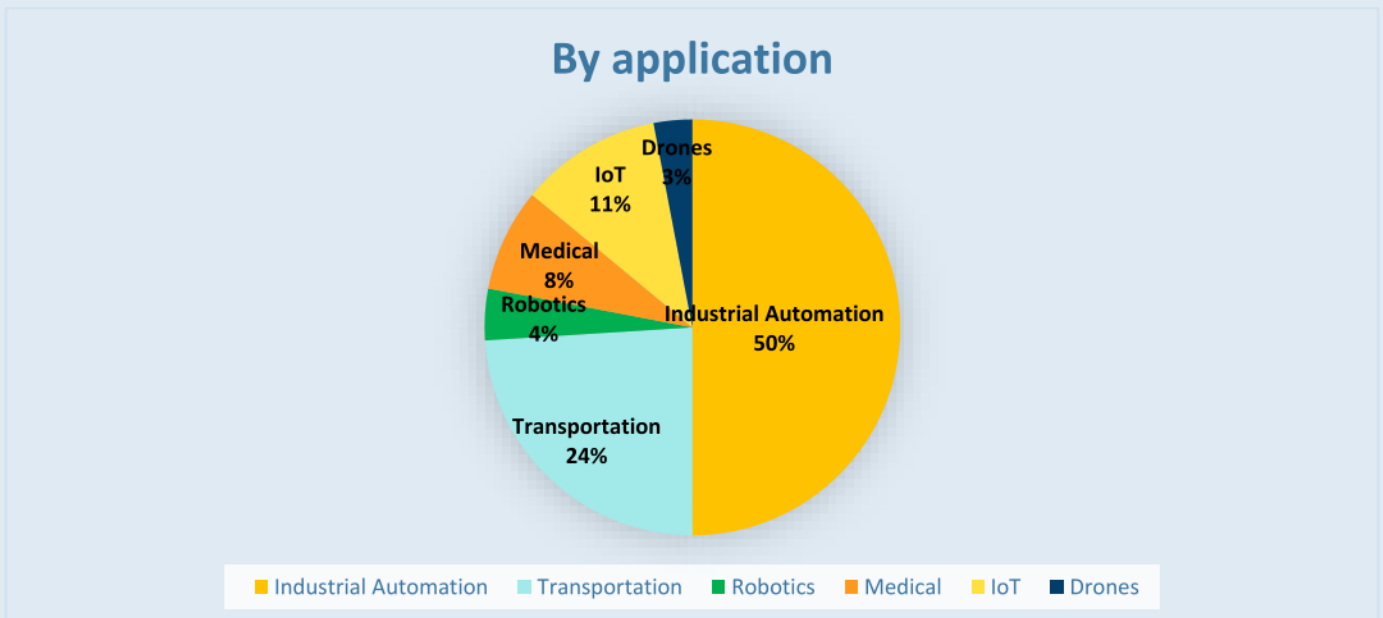
Market Share in US\$ Billion by Camera Sensor							
By Type	2020	2021	2022	2023	2024	2025	2026
Single Sensor	2.178	2.335	2.503	2.683	2.876	3.083	3.305
Multiple Sensor	1.452	1.557	1.669	1.789	1.918	2.056	2.204
Total	3.630	3.891	4.172	4.472	4.794	5.139	5.509



## 4.7. By Application

- ▶ Industrial Automation
- ▶ Robotics
- ▶ Transportation
- ▶ Medical
- ▶ IoT
- ▶ Drones

Market Share in % by Type	
By Type	Share
Industrial Automation	50%
Transportation	24%
Robotics	4%
Medical	8%
IoT	11%
Drones	3%



Market Share in US\$ Billion by Application							
By Type	2020	2021	2022	2023	2024	2025	2026

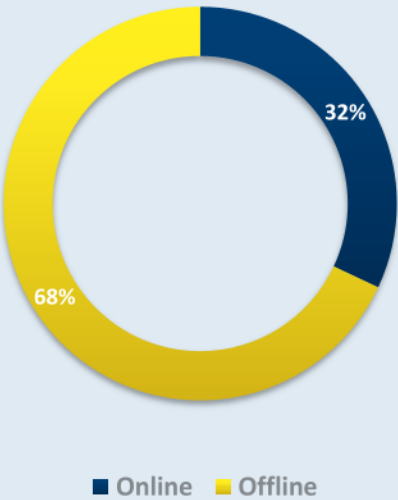
<b>Industrial Automation</b>	1.815	1.946	2.086	2.236	2.397	2.570	2.755
<b>Transportation</b>	0.871	0.934	1.001	1.073	1.151	1.233	1.322
<b>Robotics</b>	0.145	0.156	0.167	0.179	0.192	0.206	0.220
<b>Medical</b>	0.290	0.311	0.334	0.358	0.384	0.411	0.441
<b>IoT</b>	0.399	0.428	0.459	0.492	0.527	0.565	0.606
<b>Drones</b>	0.109	0.117	0.125	0.134	0.144	0.154	0.165
<b>Total</b>	<b>3.630</b>	<b>3.891</b>	<b>4.172</b>	<b>4.472</b>	<b>4.794</b>	<b>5.139</b>	<b>5.509</b>

#### 4.8. By Distribution Channel

- Online
- Offline

Market Share in % by Type	
By Type	Share
Online	32%
Offline	68%

By Distribution Channel



Market Share in US\$ Billion by Distribution Channel							
By Type	2020	2021	2022	2023	2024	2025	2026
Online	1.162	1.245	1.335	1.431	1.534	1.644	1.763
Offline	2.468	2.646	2.837	3.041	3.260	3.495	3.746
Total	3.630	3.891	4.172	4.472	4.794	5.139	5.509