



photo courtesy of Measurement Resources

[CLICK TO VIEW](#)

[Table of Contents 2](#)

[List of Tables & Charts 3](#)

[Study Overview 4](#)

[Sample Text, Table & Chart 5](#)

[Sample Profile, Table & Forecast 6](#)

[Order Form 7](#)

[About Freedonia, Custom Research, Related Studies, Corporate Use License 8](#)

Sensors

US Industry Study with Forecasts for **2012 & 2017**

Study #2377 | July 2008 | \$4600 | 328 pages

www.freedoniagroup.com



The Freedonia Group

767 Beta Drive

Cleveland, OH • 44143-2326 • USA

Toll Free US Tel: 800.927.5900 or +1 440.684.9600

Fax: +1 440.646.0484

E-mail: info@freedoniagroup.com

Table of Contents

EXECUTIVE SUMMARY

MARKET ENVIRONMENT

General	4
Macroeconomic Outlook	5
Personal Income & Expenditure Patterns..	10
Fixed Investment	12
Manufacturing Outlook.....	15
Electrical & Electronic Sector Outlook.....	18
Market Volatility	21
Pricing Patterns	23
International Environment.....	25
World Supply & Demand	26
Trends in US Foreign Trade	29
Imports.....	30
Exports	32

TECHNOLOGY OVERVIEW

General	34
Sensor Technology	35
Electrical & Magnetic.....	38
Photoelectric & Optoelectronic.....	41
Mechanical	42
Sonic & Ultrasonic	44
Other	46
Advanced Technological Concepts	46
Micro-Electro-Mechanical	
Systems (MEMS).....	47
Smart Sensors & Smart Dust.....	49
Nanotechnology.....	51
Electronic Noses & Tongues	53
Electronic Noses	54
Electronic Tongues	57
Telematics	59

PRODUCTS

General	62
Process Variable Sensors.....	66
Pressure Sensors	69
Differential & Gauge	71
Vacuum & Absolute	72
Temperature Sensors.....	72
Thermocouples	75
Thermistors.....	76
Resistance Temperature Detectors.....	77
Other	78

Flow & Level Sensors	79
Ultrasonic & Electromagnetic	81
Mass Flow	82
Differential Pressure	83
Other	84
Other Process Variable Sensors	85
Physical Property Sensors	87
Speed Sensors	89
Motion Sensors	93
Other Physical Property Sensors.....	97
Proximity & Positioning Sensors	99
Chemical Property Sensors	104
Electrical Property Sensors	108
Imaging Sensors	111
Other Sensors & Transducers	115

MARKETS

General	118
Motor Vehicles.....	121
Motor Vehicle Sector Outlook	122
Automotive Electronics Demand	124
Motor Vehicle Sensor Market	129
Demand by Sensor Type	133
Demand by Motor Vehicle System ...	134
Engine & Drivetrain	136
Safety & Security	139
Emissions Control.....	143
Other	147
Industrial	150
Process Manufacturing Outlook.....	151
Process Control Sensor Market.....	154
Machinery Outlook	156
Machinery Sensor Market.....	158
Military/Aerospace	160
Military/Aerospace Sector Outlook	161
Military/Aerospace Sensor Market	164
Electronic Security	167
Electronic Security Outlook.....	168
Electronic Security Sensor Market	170
Medical	174
Health Care Sector Outlook.....	174
Medical Sensor Market	177
Consumer Electrical &	
Electronic Products.....	179
Consumer Electrical & Electronic	
Sensor Market.....	181
Household Appliances.....	182
Consumer Electronics.....	184
Information Technology	186
Information Technology Outlook.....	187
Information Technology Sensor Market	188
Other Markets.....	191

INDUSTRY STRUCTURE

General	195
Industry Composition	196
Market Share & Leading Producers	199
Research & Product Development.....	201
Manufacturing	203
Marketing & Distribution	206
Financial Issues & Requirements.....	209
Mergers & Acquisitions.....	211

COMPANY PROFILES

AMETEK Incorporated	217
Analog Devices	222
Autoliv Incorporated	224
Avago Technologies	226
Banner Engineering	227
Bosch (Robert) GmbH	230
Cherry Corporation	233
Continental AG	235
Danaher Corporation.....	238
Delphi Corporation	241
Eaton Corporation	244
Emerson Electric	246
Ford Motor	250
Freescale Semiconductor	252
General Electric	253
Goodrich Corporation	256
Heraeus Holding	260
Honeywell International.....	263
Invensys plc.....	270
Johnson Controls	272
Measurement Specialties	274
Nagano Keiki	278
NGK Spark Plug.....	280
Northrop Grumman	281
OMRON Corporation	285
PerkinElmer Incorporated	288
Raytheon Company.....	290
Rockwell Automation	292
Schneider Electric	294
Sensata Technologies.....	298
Siemens AG	302
Stoneridge Incorporated.....	306
TRW Automotive	307
TT electronics.....	310
Tyco Electronics.....	312
Vishay Intertechnology	315
Visteon Corporation.....	317
Other Companies Mentioned	
in the Study.....	318

List of Tables/Charts

EXECUTIVE SUMMARY

1 Summary Table3

MARKET ENVIRONMENT

1 Macroeconomic Indicators 10
 2 Personal Consumption Expenditures .. 12
 3 Nonresidential Fixed
 Investment Expenditures..... 15
 4 Manufacturers' Shipments..... 18
 5 Electrical & Electronic
 Product Shipments 21
 6 Sensor Market Volatility 22
 Cht Sensor Market Volatility, 1997-2007.. 23
 Cht Sensor Pricing Patterns 25
 7 World Sensor Demand by Region..... 29
 8 US Foreign Trade in Sensors..... 30
 Cht US Sensor Imports by Source, 2007... 32
 Cht US Exports by Destination, 2007 33

TECHNOLOGY OVERVIEW

1 Sensor Demand by Technology 37
 Cht Sensor Demand by Technology, 2007 .37
 2 Micro-Electro-Mechanical
 System Demand 49

PRODUCTS

1 Sensor Supply & Demand..... 65
 Cht Sensor Demand by Type 66
 2 Process Variable Sensor
 Demand by Type 68
 Cht Process Variable Sensor
 Demand by Type, 2007..... 68
 3 Pressure Sensor Demand..... 71
 4 Temperature Sensor Demand 75
 5 Flow & Level Sensor Demand..... 81
 6 Other Process Variable
 Sensor Demand..... 87
 7 Physical Property Sensor
 Demand by Type 88

Cht Physical Property Sensor
 Demand by Type, 2007 89
 8 Speed Sensor Demand..... 93
 9 Motion Sensor Demand 96
 10 Other Physical Property
 Sensor Demand..... 99
 11 Proximity & Positioning Sensor
 Demand by Type 104
 12 Chemical Property Sensor Demand
 by Type & Analyte..... 108
 13 Electrical Property Sensor
 Demand by Type 111
 14 Imaging Sensor Demand by Type 115
 15 Other Sensor Demand 117

MARKETS

1 Sensor Demand by Market..... 120
 Cht Sensor Demand by Market, 2007 120
 2 Motor Vehicle Outlook 124
 3 OEM Automotive
 Electronics Market..... 128
 4 Motor Vehicle Sensor Market
 by Type & System 132
 Cht Average Number of Sensors
 per Vehicle 133
 Cht Motor Vehicle Sensor
 Demand by Type 134
 Cht Motor Vehicle Sensor
 Demand by System..... 135
 5 Selected Sensors in Motor Vehicles
 by System & Sensor Type..... 136
 6 Motor Vehicle Engine & Drivetrain
 Sensor Market..... 139
 7 Motor Vehicle Safety & Security
 System Sensor Market..... 143
 8 Motor Vehicle Emissions Control
 System Sensor Market..... 147
 9 Other Motor Vehicle System
 Sensor Market..... 150
 10 Industrial Sensor Market 151
 11 Process Manufacturers' Shipments... 154

12 Process Control Sensor Market..... 156
 13 Machinery Shipments..... 158
 14 Machinery Sensor Market..... 160
 15 Aerospace Shipments &
 Defense Expenditures 163
 16 Military/Aerospace Sensor Market ... 167
 17 Electronic Security
 Product Shipments 170
 18 Electronic Security Sensor Market ... 173
 19 Health Care Indicators 177
 20 Medical Sensor Market 179
 21 Consumer Electrical & Electronic
 Product Shipments 180
 22 Consumer Electrical & Electronic
 Sensor Market..... 181
 23 Household Appliance
 Sensor Market..... 184
 24 Consumer Electronics
 Sensor Market..... 186
 25 Information Technology
 Equipment Shipments 188
 26 Information Technology
 Sensor Market..... 191
 27 Other Sensor Markets..... 194

INDUSTRY STRUCTURE

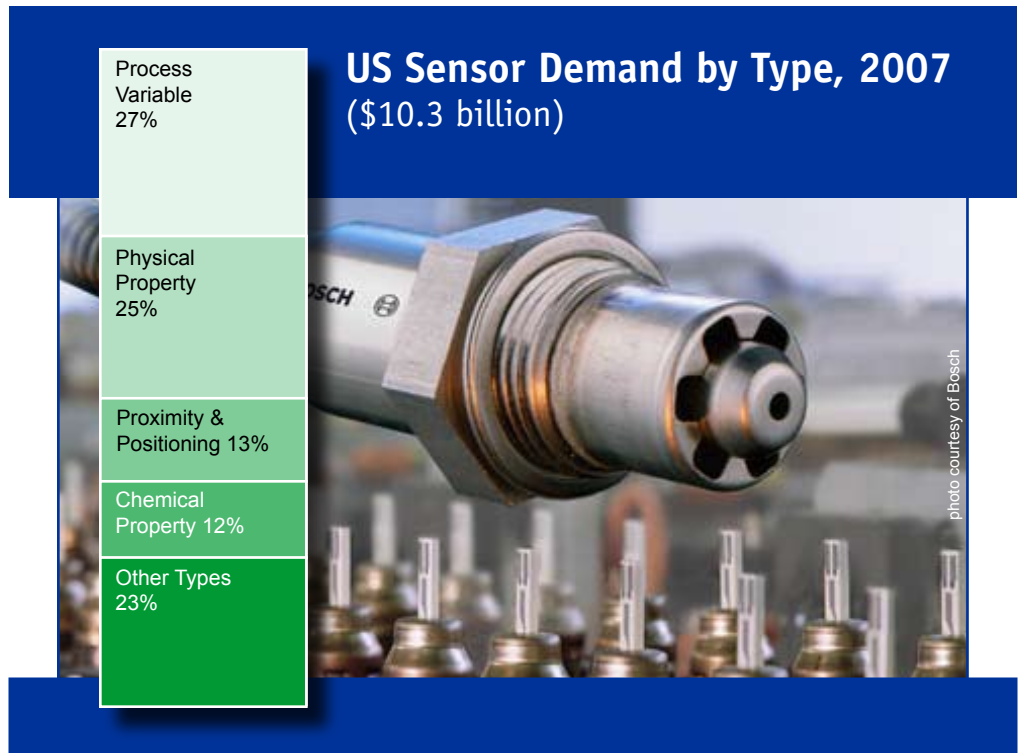
1 Sensor Sales by Company, 2007 198
 Cht US Sensor Market Share
 by Company, 2007..... 201
 2 Research & Development Spending
 Patterns: Selected Sensor
 Manufacturers, 2005-2007..... 203
 3 Capital Spending Patterns:
 Selected Sensor Manufacturers,
 2005-2007 205
 4 Selected Cooperative Agreements ... 208
 5 Composite Financial Ratios:
 Selected Sensor Manufacturers,
 2005-2007 211
 6 Selected Acquisitions
 & Divestitures 213

Demand will be supported by increasing output of major sensor-containing products such as motor vehicles, with sensors based on emerging technologies seeing the fastest gains.

Imaging, proximity/positioning, chemical property sensors to lead gains

US demand for sensors, transducers and associated housings is projected to increase 4.3 percent annually to \$12.7 billion in 2012, supported by increasing output of major sensor-containing products such as motor vehicles. Demand for sensors based on emerging technologies, such as MEMS-based and imaging sensors, will see the fastest gains. Process variable sensors will continue to be the largest product type, although these sensors are more mature and are expected to grow at below-average rates.

Through 2012, imaging, proximity/positioning and chemical property sensors are expected to record the most rapid advances. Imaging sensors -- including charge-coupled devices (CCD), complementary metal-oxide semiconductors (CMOS) and thermal (infrared) sensors -- hold especially good prospects, rising 8.0 percent annually. CMOS imaging sensors will continue to take significant market share from CCDs, as they benefit from their lower costs, lower power requirements and higher speeds. Thermal imaging sensors will receive a significant boost from rising military expenditures, as well as increased importance in new markets such as police departments, fire departments, structural testing companies, original equipment manufacturers (OEMs) and private consumers.



Proximity and positioning sensors will also record rapid advances, due to increases in motor vehicle production and continued expansion of the industrial sector, both of which are large consumers of newer and more mature sensors. Demand for chemical property sensors will benefit from technological advances that allow for price reduction, sensor miniaturization and greater precision, all of which will expand chemical sensor applications.

Automotive market among fastest growing end uses

Overall, the automotive industry will be among the fastest growing sensor markets and will continue to represent

the largest sector for sensors. Demand for sensors in automotive safety and security systems will post strong gains, boosted by both mandated changes (e.g., electronic stability control systems and tire pressure monitoring requirements) and consumer preferences for newer safety features. In addition, further gains will come from automakers' desires to add value to their vehicles and differentiate themselves from competitors. While the industrial sensor market will post below-average growth due to the high degree of maturity and downward pricing pressure, increased aerospace equipment shipments and defense expenditures will continue to drive strong growth for sensors in the military/aerospace markets.

Copyright 2008 The Freedonia Group, Inc.

[Click here to purchase online](#)

Sample Text, Table & Chart

MARKETS

Motor Vehicle Sensor Market

The US market for automotive sensors will increase annually of the fastest increases of the major sensor types. Improvement over 2007 performance is supported by both market and consumer demand for safety and security features being added to new models of automotive vehicles as Tier 2 manufacturers implement transportation Recall Emission Accounting (TREAD) Act and new requirements for light vehicles to be equipped with ESC systems increases. In addition, the continued introduction of continuous transmissions, electronically-controlled diesel engines, hybrid passenger cars and light trucks, and additional gasoline engines such as cylinder deactivation, will increase per-vehicle sensor and value. Furthermore, the rebound in motor vehicle production will boost demand for all types of motor vehicle sensors.

The overall growth rate does disguise some weaknesses in products, especially sensors for engines and drivetrains such as sensors, knock sensors and vehicle speed sensors. Many of these devices have virtually achieved universal market penetration and are commodities, subject to strong pricing pressures. As a result, growth for these types of sensors is expected to remain below average, especially as per unit prices drop. Still, the development of newer sensor products and the increased penetration of more advanced safety and emissions control systems will support overall gains in the automotive market for the foreseeable future.

The average number of sensors per vehicle in the US has risen rapidly over the past decade to over 35 sensors, with some high-end vehicles now equipped with more than 50. The largest gain occurred in the late 1990s, as a result of the introduction of the onboard diagnostic II

129

Copyright 2008 The Freedonia Group, Inc.

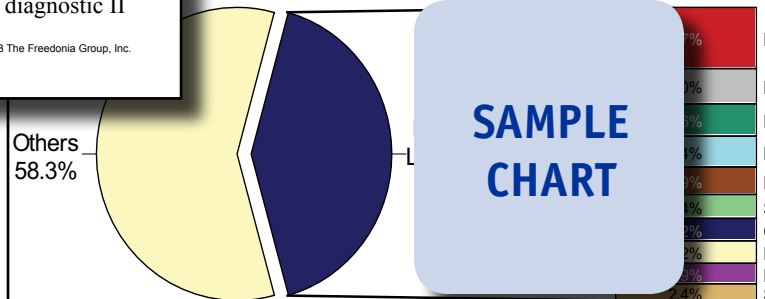
SAMPLE
TEXT

TABLE V-4 MOTOR VEHICLE SENSOR MARKET BY TYPE & SYSTEM (million dollars)					
Item	1997	2002	2007	2012	2017
Motor Vehicle Production (000 units) 12					50
\$ sensors/vehicle					9
Motor Vehicles & Parts Shpts (bil \$) 4					0
\$ sensors/000\$ vehicles & parts					8
Motor Vehicle Sensor Market					0
By Type:					
Process Variable					5
Physical Property					0
Proximity & Positioning					0
Chemical Property					0
Other					5
By System:					
Engine & Drivetrain					5
Safety & Security					5
Emissions Control					5
Other					5
% motor vehicle					2
Total Sensor Market	82	102	132	162	200

SAMPLE
TABLE

CHART VI-1

SENSOR MARKET SHARE BY COMPANY, 2007
(\$10.3 billion)



SAMPLE
CHART

Sample Profile, Table & Forecast

TABLE IV-12
CHEMICAL PROPERTY SENSOR DEMAND BY TYPE & ANALYTE
 (million dollars)

Item	1997	2002	2007	2012	2017
Manufacturers' Shipments (bil \$)	36	40	45	50	57
\$ sensors/000\$ shpts	0	0	0	0	0
Chemical Property Sensor Demand					
By Type:					
Electrochemical					
Optical					
Other					
By Analyte:					
Gas Phase					
Liquid & Solid Phase					
% chemical property					
Total Sensor Demand	822	971	1030	1270	1360



COMPANY PROFILES

Banner Engineering Corporation
 9714 Tenth Avenue North
 Minneapolis, MN 55441
 763-544-3164
<http://www.banner-engineering.com>



Annual Sales:
 Employment:

Key Products: and inspection,
 and vision sen:

Banner Engineering is a privately held manufacturer of sensors and machine safety products. The Company serves such markets as wastewater treatment, processing, semiconductor fabrication, industrial machinery, measurement, microelectronics, motion control, transportation, systems integration, automotive and computer manufacturing, and aerospace.

Among the sensors produced by Banner Engineering are photoelectric, precision measurement and inspection, and vision types. Photoelectric sensors are used in industrial control applications to monitor changes in the intensity of visible and invisible light. The Company's photoelectric sensors are available through a number of series. These series include OMNI-BEAM, MULTI-BEAM, MAXI-BEAM, WORLD-BEAM, VALU-BEAM, MINI-BEAM, ECONO-BEAM, PICODOT PD, EZ-BEAM and M-GAGE.

Banner Engineering's photoelectric sensors include the following: miniature sensors for use in confined areas; compact, mid-size and full-size sensors for sensing at different distances; remote amplifier sensors

"The US market for electrical property sensors is projected to increase 3.6 percent annually to \$1.4 billion in 2012. Gains will be supported by the ongoing increasing demand for electrical and electronic equipment, which will generate demand for instruments that measure electrical property as a matter of course. Generally sanguine prospects in the aerospace and industrial equipment sectors -- other key markets for electrical property sensors -- portend favorable growth as well."
 --Section IV, pg. 108

ONLINE: www.freedoniagroup.com

MAIL: Print out and complete the order form and send to The Freedonia Group (see address at the bottom of this form)

PHONE: Call toll free, 800.927.5900 (US) or + 1 440.684.9600

FAX: + 1 440.646.0484 (US)

EMAIL: info@freedoniagroup.com

Free Handling & Shipping

There is NO charge for handling or UPS shipping in the US. Expect delivery in 3 to 5 business days. Outside the US, Freedonia provides free airmail service. Express delivery is available at cost.

Orders Outside of the US

Checks must be made payable in US funds, drawn against a US bank and mailed directly to The Freedonia Group. For wire transfers please contact our customer service department at info@freedoniagroup.com. Credit cards accepted.

Credit Card Orders

For convenience, Freedonia accepts American Express, MasterCard or Visa. Credit card purchases must include account number, expiration date and authorized signature.

Save 15%

If you order three (3) different titles at the same time, you can receive a 15% discount. If your order is accompanied by a check or wire transfer, you may take a 5% cash discount (discounts do not apply to Corporate Use Licenses).

Corporate Use License

Now every decision maker in your organization can act on the key intelligence found in all Freedonia studies. For an additional \$2300, companies receive unlimited use of an electronic version (PDF) of the study. Place it on your intranet, e-mail it to coworkers around the world, or print it as many times as you like,

[Click here to learn more about the Corporate Use License](#)

ORDER FORM

F-WEB.2377

Sensors..... \$4600

Corporate Use License (add to study price) * + \$2300

Additional Print Copies @ \$500 each *

Total (including selected option) \$_____

Enclosed is my check (5% discount) drawn on a US bank and payable to The Freedonia Group, Inc., in US funds (Ohio residents add 7.75% sales tax)

Bill my company American Express MasterCard Visa

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Credit Card #

--	--	--	--	--	--	--	--	--	--

Expiration

Signature _____

Name _____

Title _____

Company _____

Division _____

Street _____
(No PO Box please)

City/State/Zip _____

Country _____

Phone _____ Fax _____

Email _____

* Please check appropriate option and sign below to order an electronic version of the study.

Corporate Use License Agreement

The above captioned study may be stored on the company's intranet or shared directory, available to company employees. Copies of the study may be made, but the undersigned represents that distribution of the study will be limited to employees of the company.

Signature _____

Individual Use License Agreement

The undersigned hereby represents that the above captioned study will be used by only ___ individual(s) who are employees of the company and that the study will not be loaded on a network for multiple users. In the event that usage of the study changes, the Company will promptly notify Freedonia of such change and will pay to Freedonia the appropriate fee based on Freedonia's standard fee schedule then in effect. Note: Entire company corporate use license, add \$2300; one additional user, add \$500; two additional users, add \$1000; three additional users, add \$1500.

Signature _____

OTHER STUDIES

Analytical Instruments

This study covers the US analytical instrument industry. It presents historical demand data (1997, 2002 and 2007) and forecasts for 2012 and 2017 by instrument type (e.g., electrochemical, chromatographic, spectrophotometric, thermal analysis, mass spectroscopy, chemistry and medical laboratory) and market (e.g., pharmaceutical, biotechnology, government and academic). The study also considers market environment indicators and industry regulations, evaluates company market share and profiles leading competitors.

#2403 09/2008..... \$4600

Chemical Sensors

US demand for chemical sensors will grow 7.6% annually through 2012. Biosensors will continue to be the largest type, as the increasing number of diagnosed diabetics boosts demand for glucose test strips. Demand for chemical sensors based on emerging technologies, such as optical sensors, will see the fastest gains. This study analyzes the \$3.8 billion US chemical sensor industry, with forecasts for 2012 and 2017 by sensor type, analyte and market. It also evaluates market share and profiles 46 industry participants.

#2355 05/2008..... \$4500

Insulated Wire & Cable in China

Demand for insulated wire and cable in China will grow 13% annually through 2011. Gains will be fueled by strong investment in the power grid, telecommunication and building construction sectors, as well as by further increases in the manufacture of products that use insulated wire and cable. This study analyzes the ¥181 billion insulated wire and cable industry in China, with forecasts for 2011 and 2016 by material, product, market and region. It also evaluates company market share and profiles industry participants.

#2338 05/2008..... \$5100

Industrial Controls

US demand for industrial controls will reach \$15.4 billion in 2011. Advanced controls will outpace conventional types and boost demand for software and system integration services. Durable goods industries, which include electrical/electronic equipment and machinery, will remain the largest market while service industries grow the fastest. This study analyzes the US industrial controls industry, with forecasts for 2011 and 2016 by product and market. It also details market share and profiles major players.

#2269 11/2007..... \$4400

World Nanomaterials

The global market for nanomaterials will reach \$4.2 billion by 2011 and remain concentrated in the US, Western Europe and Japan. Products making the greatest initial commercial impact are nanoscale versions of conventional materials such as silica, titanium dioxide, alumina, iron oxide, and zinc oxide. This study analyzes the \$1 billion global nanomaterials industry, with forecasts for 2011, 2016 and 2025 by product, market, world region and for 15 countries. It also discusses R&D and profiles major participants.

#2215 08/2007..... \$5500

About The Freedonia Group

The Freedonia Group, Inc., is a leading international industry market research company that provides its clients with information and analysis needed to make informed strategic decisions for their businesses. Studies help clients identify business opportunities, develop strategies, make investment decisions and evaluate opportunities and threats. Freedonia research is designed to deliver unbiased views and reliable outlooks to assist clients in making the right decisions. Freedonia capitalizes on the resources of its proprietary in-house research team of experienced economists, professional analysts, industry researchers and editorial groups. Freedonia covers a diverse group of industries throughout the United States, the emerging China market, and other world markets. Industries analyzed by Freedonia include:

- Chemicals • Plastics • Life Sciences • Packaging • Building Materials • Security & Electronics • Industrial Components & Equipment • Automotive & Transportation Equipment • Household Goods • Energy/Power Equipment

[Click here to learn more about Freedonia](#)

Freedonia Custom Research

Freedonia Custom Research delivers the same high quality, thorough and unbiased assessment of an industry or market as an industry study. Since the research initiative is based upon a company's specific needs, companies harness Freedonia's research capabilities and resources to answer unique questions. When you leverage the results of a Freedonia Custom Research engagement, you are able to obtain important answers to specific questions and issues associated with: mergers and acquisitions, new product launches/development, geographic expansion, entry into new markets, strategic business planning, and investment and funding decisions.

Freedonia Custom Research is ideal for companies seeking to make a strategic difference in the status quo and focus on future business growth. Working side by side with clients, Freedonia's team is able to define a research project that is custom-tailored to answer specific questions and provide the basis from which a company can make informed business decisions.

[Click here to learn more about Custom Research](#)



[Click here for complete title list](#)

[Click here to visit freedoniagroup.com](http://www.freedoniagroup.com)