

## White Paper - Lighting Design

### Executive summary

The latest market research report by Technavio suggests the global automotive LED lighting market is expected to grow at a CAGR of over 10% during the period 2019-2023. The key factor which is likely to drive the growth of the market is the increasing use of LEDs in automotive intelligent lighting system applications. The application of LEDs has become an essential component in automotive intelligent lighting systems, including taillights, brake lights, and other energy-efficient as well as compact headlights.

LEDs not only offer aesthetic lighting for vehicles but are also cost-effective. Hence, the major automotive OEMs offer glare-free lighting, high-definition lighting, and homogenous lighting to meet the evolving needs of automated driving technology. Furthermore, the fact that LEDs help taillights and brake lights to operate at different brightness levels make them a significant lighting technology for the rear intelligent lighting system.



## Automotive LED Lighting Market: Segmentation by Region



### Asia-Pacific is likely to be the largest market during the forecast period

APAC is anticipated to be the largest market due to rapid consumer adoption and high sales of automobiles. China and Japan garnered the largest shares within the market because of the high production & sales of vehicles, domestically. Additionally, manufacturers in these countries focus on technological advancements such as LED lightings, which is increasing the demand for automotive lighting. The rise in the consumer per capita income and high sales of SUVs in emerging economies such as India is expected to drive the market further.

There is a high demand for advanced lighting due to the increase in premium car sales. The increasing adoption of advanced lighting in the lower and mid-segment cars is expected to exploit new opportunities and propel the market in APAC.

Nearly 57% of the market growth will originate from APAC during the forecast period. China and Japan are the key markets for automotive LED lighting. However, the market growth in APAC is likely to be slower than the market in South America and MEA.

The APAC region is likely to attract global players to set up their manufacturing facilities in the region on account of low labor costs and tax relaxation offered by regional governments. Several prominent market vendors are investing significantly to expand their presence in APAC as the manufacturing cost of LEDs in the region is significantly low.

## Key Market Players

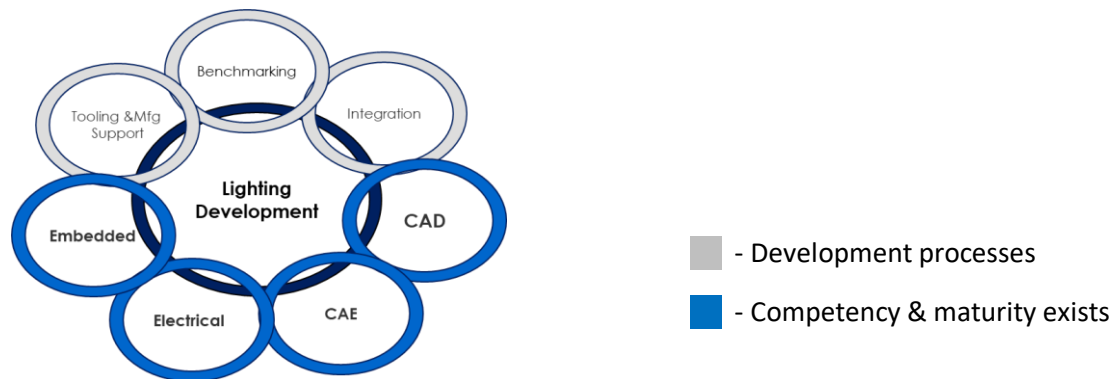
Key players of the automotive lighting market are

|                              |                          |
|------------------------------|--------------------------|
| Hella (Germany)              | Lumax (India)            |
| Marelli (Italy)              | Aptiv (Netherlands)      |
| Osram (Germany)              | Grupo Antolin (Spain)    |
| Valeo (France)               | Lear Corporation (US)    |
| Continental (Germany)        | Keboda (China)           |
| Philips (Netherlands)        | NXP (Netherlands)        |
| Bosch (Germany)              | Gentex (US)              |
| Varroc (India)               | FlexNGate (US)           |
| Hyundai Mobis (South Korea)  | Federal-Mogul (US)       |
| Koito (Japan)                | Stanley Electric (Japan) |
| Denso (Japan)                | Ichikoh (Japan)          |
| North American Lighting (US) | Zizala (Austria).        |
| Renesas (Japan)              |                          |

## ALLEN India's Contributions in the Automotive Lightings Segment

ALLEN India's highly skilled team extensively support exterior and interior lighting projects for global tier 1 manufacturers. The team has successfully executed 4 Front / 3 rear /6 small lamp projects, achieving delightful customer satisfaction, and continuing the support with CAD/technical capabilities.

ALLEN India's experts are up-to-date with regards to trending LED technology, which is evolving with advanced features such as adaptive headlights technology and bending beam lights.





Going forward, observing the global trend towards LED lighting, one can foresee good workforce requirements catering to huge demand in this niche area.

ALLEN India's experienced team can handle:

- Design and concept development
- Checking of legal conformance and visibility
- Design support and class-A surfaces
- Layout schemes and designs
- Emerging technology like projector system and AFS technology
- Emerging light sources such as LED, halogens, xenon, and others
- Well-versed with regulatory requirements such as ECE, FMVSS, and CMVR
- Global experience
- Highly skilled on the software like CATIA V5, NX to name a few

The experts also cater to the areas of seating and interior trims for automotive passenger vehicles.

## [Selected Market Dynamics in the Automotive Interior Market](#)

### **The increasing demand for interior styling, cabin comfort, perceived quality, and convenience features**

The automotive interior solution in the automotive industry has transformed in recent years. The complexities in controlling and operating functions have been drastically reduced. Further, comfort features and electronic systems have been introduced in seat, lighting, and infotainment systems that enhance the overall experience of the driver in a vehicle. The share of the electronics system in vehicles has surged from 1% to 2% to 8% to 12% of the vehicle cost due to the increasing demand for enhanced user experience and convenience features.

The amount of time people spend inside vehicles is increasing substantially because of the high traffic and the growing need for transportation. Hence, there is an increasing interest in the comfort and convenience features offered by vehicles. The increasing demand for such features has led to the development and integration of innovative technologies that reduce human efforts and maximizes comfort as well as aesthetics of vehicles.

The OEMs integrate these technologies in vehicle interiors to enhance the overall customer satisfaction levels and to stay competitive in the global automotive interior market. As a result, various manually operated systems have been replaced with electronically controlled systems and the vehicle interiors are designed to maximize the ergonomics.



## The high cost of advanced automotive interior electronics components

The automotive interior market has witnessed numerous innovations and technological advancements. Consumer-friendly and regulatory compliance systems are important aspects of an automotive interior system development. The prices of advanced automotive interior components have decreased in the past few years. However, advanced automotive interior electronics components are still at a higher price range. Hence, these are presently offered in only high-end luxury cars as affluent customers, who buy luxury cars are likely to pay a higher price for convenience and innovations. On the other hand, mid-priced passenger vehicles are often equipped with basic electronic interior systems such as infotainment display and a digital/analog instrument cluster. These innovative technologies and high-cost components wouldn't find much application in low-end or economic segment cars unless the price is reduced. The high cost of these components is anticipated to hinder the growth of the advanced and innovative automotive interior components in the automotive market.

## Automotive Interior Market by Component

- Center/Floor Console
- Cockpit Module
- Door Panel
- Headliner
- Infotainment Systems
- Interior Lighting
- Automotive Seats

**The Automotive Interior Market** is projected to grow at a CAGR of 5.06% from USD 235.59 billion in 2017 to USD 301.56 billion by 2022. The increase in the demand for premium segment vehicles with advanced styling, coupled with the growing demand for cabin comfort and convenience is expected to drive the automotive interior market growth.

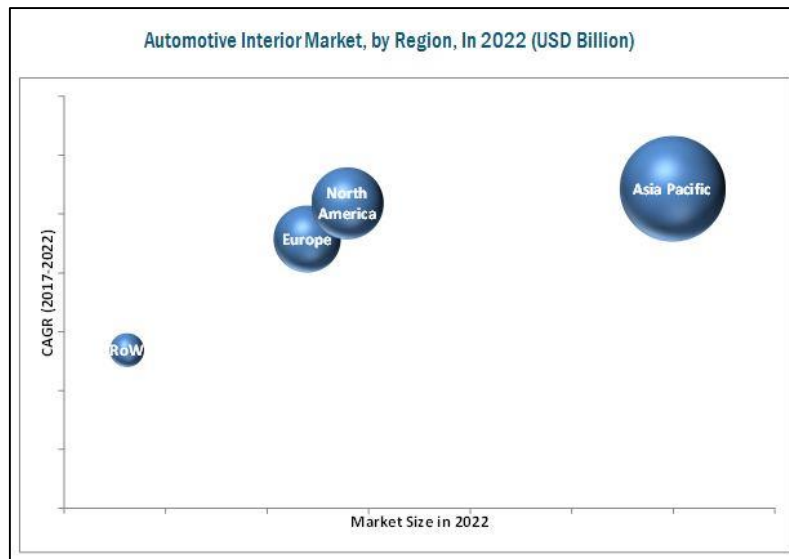
**The Automotive Seat Segment** is estimated to register the largest revenue share in the automotive interior market, by component, during the forecast period. The average distance traveled by passengers has increased over the years. Thus, the need for comfort and convenience has increased substantially. Modern-day consumers have higher disposable income and are willing to spend more on travel and comfort. These factors are expected to positively influence the growth of the market.

**Infotainment Systems** are estimated to be the fastest-growing segment in terms of value. Several infotainment systems provide features such as time and temperature display, navigation, and more. The types of displays being used for infotainment systems may vary depending upon the cost of the vehicle, for example, a basic infotainment system can be used in economy cars, while advanced display for premium cars.

**The Passenger Vehicles (PVs)** are estimated to be the largest segment by vehicle type, in terms of value. The quality of automotive interior components being perceived by a consumer is much higher in PVs than commercial vehicles. Consumers are willing to spend more on vehicles for personal use than commercial use. The increasing number of PVs is expected to positively impact the growth of the automotive interior market.

**Asia-Pacific is estimated to lead the automotive interior market by region**

The tremendous amount of vehicle production in countries such as China and Japan have led to the growth of the global automotive interior market in the region. The increasing disposable income in developing economies such as India and China is expected automotive interior styling and components to witness a significant rise and contribute to the market growth.



The emergence of industry-wide standards such as the 3D displays, HUDs, smart seating system, OLED interior lights, LED-lighted headliner would trigger growth in the automotive interior market. The growing demand for convenience and safety also presents an opportunity for OEMs to develop new and innovative automotive interior components that would attract customers.

### Passenger Cars

The passenger vehicle interior market is the largest market globally. Passenger vehicles are the most focused segment for automotive interior manufacturers. The technologies used in these types of vehicles are dynamic due to high demand from consumers for luxurious features. Further, the government regulations for emission and safety for passenger vehicles frequently change. Hence, manufacturers are mandated to adhere to the regulations and provide safety to consumers at a lower price. The installation of electronic content is increasing in the interiors of passenger vehicles owing to the high demand for autonomous and electric vehicles. This is one of the major factors driving the growth of the passenger vehicle interior market.

### Light Commercial Vehicles (LCVs)

LCVs are light-good carrier vehicles that are used for commercial purposes. APAC is the largest producer of LCVs and accounted for 53% of the market share of the global LCVs production in 2016. The use of LCVs is higher in developing countries than in developed countries. These vehicles are convenient for supplying goods to remote places. Moreover, LCVs help small and medium scale industries for the transportation of raw materials and finished goods. North America accounted for steady growth in LCVs production as well, due to the utilization of these vehicles in small and medium industries and their capability to be used in off and on the road. OEMs focus to integrate the comfort and safety features considering the overall cost of vehicles owing to their commercial applications. LCVs market is likely to



increase at a steady pace globally. Hence, this is expected to be in the best interests of the growth of the global LCV interior market.

## **Heavy Commercial Vehicles (HCVs)**

The HCVs segment consists of trucks, buses, and coaches. These types of vehicles are used for carrying heavy goods and public transportation. Drivers of these vehicles spend the maximum amount of time in the vehicle during long-haul for transportation of goods and passengers. Hence, the interiors of these vehicles should be more convenient and comfortable for the passengers and driver. These types of vehicles experience a high degree of wear and tear, depending on the nature of the operation. Therefore, manufacturers of automotive interiors focus to use material and technology, which is durable and efficient. Moreover, the vehicles need to be light-weight in order to reduce carbon emissions. Several regulations implemented by different governments are driving the OEMs to use high-quality material, which increases the price pressure on commercial vehicle manufacturers.

## **Cockpit Module**

The cockpit module is a pre-assembly of the driver's interfaces in the dashboard. Over the years, functionalities and features offered in the cockpit module have increased. The module design differs according to the vehicle model and the growing integration of electronics such as HVAC units, navigation, and safety systems among others has increased the complexity of the design. The electrification of the vehicle directly influences the design and specification of the cockpit module, compelling suppliers to improve their manufacturing capabilities and engineering expertise. Since, the cockpit module houses the interface for many electronic and mechanical interfaces, the HMI factor is one of the important considerations in designing cockpit modules. Increased fuel and performance efficiency requirements in the automotive industry have resulted in a weight reduction of the components and usage of lightweight raw materials. Cockpit module suppliers are focusing on recycling, efficiency, space, weight optimization, and simultaneously providing design flexibility to the OEMs.

## **Door Panel**

Automobile door panels are components that help to mitigate the impact of side collisions and increase the overall safety of the occupant. The interior door panels are made up of various materials and the finish depends on the rest of the vehicle interiors, which include the dashboard and carpets among others. Door panels vary from plastic to hand-stitched leather finish, depending on the vehicle type and segment. The door panel is also designed to improve the functionality, ergonomics, and enhance the aesthetic appeal of the vehicle, which increases the efficiency of the vehicle. Door panels play an important role in the NVH, packaging, storage, and styling of the vehicle. The suppliers are currently focusing on improving technology and manufacturing processes to meet the requirements of automotive OEMs adequately, by using sustainable and lightweight materials.

## **Headliner Market**

Headliner refers to the material that is placed on the roof, which is designed to optimize the impact of countermeasure and integrate additional lighting. Headliners are designed to blend with the interiors of the vehicles to provide a consistent look of the vehicles. Headliners offer structural stiffness and reduce the noise in the interior. They consist of a tricot knit fabric with melted polyurethane foam that is



attached to the fiberglass roof of the vehicle. Sun visors are located above the windshield of the vehicle to protect the driver and front passenger from the direct glare of the sun.

### **Infotainment System**

The infotainment unit is positioned in the center of the dashboard between the front passenger seat and the driver. The system can be a basic infotainment display in economy cars or advanced display in case of premium cars. The central display nowadays offers a touchscreen, which makes it easy for the driver to operate. The touchscreen is a direct manipulation type gesture, which manipulates the digital world inside the screen without the use of command-line-command. It is a major input and output device which is layered on the electronic display of a processing system. There are different types of touchscreens such as resistive, capacitive, surface acoustic wave, infrared grid, optical imaging, and acoustic pulse recognition. These types of touchscreens provide unprecedented ease in controlling a car's function. The latest multimedia interface (MMI) touch helps the driver to input characters by using fingers to write on the designated touchscreen. The development of a multi-point touchscreen is a major contribution as it allows multiple users to interact with the device simultaneously. The growing use of touchscreen has made itself easily available, especially in mobile phones and passenger vehicles, which is resulting in a decrease in the price of the product.

### **Interior Lightings**

The interior lights include applications such as dashboard lights, reading lights, and dome lights among others. The automotive interior lightings shall comprise of Halogen, LED lights, and others. The LED lights are fitted for control cabinets, overheads, and vehicle compartments. The reading lights are offered by OEMs as an additional feature along with the dome light. The reading lights are usually LED lights as they consume less power and are brighter. Dome lights are soothing and help to illuminate the inner side of vehicles. These lights are placed in the driver's compartment to increase the driver's convenience.

### **Automotive Seats**

In the past few years, automotive manufacturers tried to maintain a balance between vehicle handling, ride comfort, and stability. Automotive seats play a vital role in the driver and passenger safety to ensure a comfortable ride. Advancements in automotive seats have enhanced ride comfort and safety. vehicle seats usually involve several adjustment mechanisms, headrests, and armrests, which promote comfort. Highly advanced and adapted technologies such as powered, heated, and massage seats have been introduced in the market. Seat systems contribute significantly to the weight of the vehicle as weight reduction has become a prime area of focus for several OEMs and seat suppliers. They are compelled to develop lightweight seat structures which retain optimum safety. Lightweight seats are not only restricted to reduce vehicular emissions but also result in better fuel efficiency. Automobile manufacturers are focused to develop high-performance and highly efficient seat systems to meet customers' demands and comply with government regulations, regards to the environment.