Snippets: **Embedded Software Industry Analysis**

An Analysis by Draup

Conceptualized and Developed: November - 2021

Document is not intended to provide client specific advice.
Copyright @2021 Draup. All rights reserved

CLICK HERE
To access the full report

Draup has analysed the market ecosystem, investment overview, key challenges, verticals sector analysis and key players deepdive for Embedded Software Industry

Embedded Software Industry Analysis

- Continuous advancements in the IoT, Artificial Intelligence (AI), and machine learnings (MI) are anticipated to increase the growth of the embedded software in the forecast.

- Rising technological advancements and an increased capability to carry data from converged networks lead to the investment of embedded software across industries.

- Increasing research & development initiatives by automotive OEMs toward ADAS and self-driving cars are expected to spur the industry growth.

- Growing demands for increased connectivity and new services are introducing new security threats and vulnerabilities for unmanned aircraft embedded systems.

- Energy utility companies are shifting to smart meters to reduce power consumption, improve operational efficiency, and enable dynamic pricing for consumers.

- Large-scale and complex industries have adopted embedded systems to improve productivity and manufacture more intelligent products.

- Solution providers leverage advanced technologies to provide solutions from smart lighting systems to home security.

- Embedded systems were introduced in the medical field to cater to medical issues that necessitated monitoring and maintenance frequently in a day.

- Embedded Systems play a vital role in the telecom industry because they help to increase ultra-speed networking capabilities.

- The technological development and the emergence of social platforms, mobile devices, video streaming, and other new broadcasting formats have transferred most of the control to the user.

- The Internet can give embedded systems access to huge amounts of data and processing and computational power.

- Fleet Management, Performance Monitoring, Mobile Computing, Smart Wearables, and Personalized Customer Experience are the major areas providing opportunities to service providers.

AGENDA

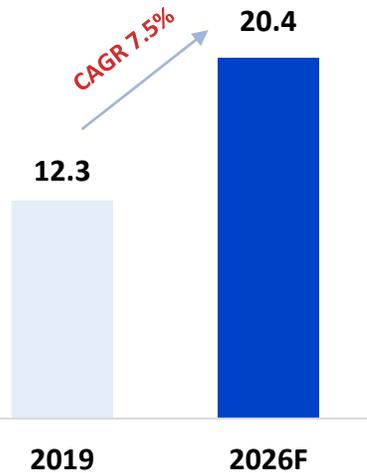|	
01	**Embedded Software/System Ecosystem**
02	**Investment Overview of Embedded Software**
03	**Key Challenges in Embedded Software Industry**
04	**Vertical Sectors Analysis**
05	**Key Players Deepdive**
06	**Key Focus Areas**

This section provides an overview of:

- Market Overview of Key Segments
- Key Trends
- Key Drivers and Challenges
- Key Players across sectors

Topics covered only in the Full Report

3

draup

Market Overview (in USD Billion)

CAGR 7.5%

20.4

12.3

2019   2026F

- The Global Embedded Software market is expected to grow from **USD 12.3 Billion in 2019 to USD 20.4 Billion in 2026, with a CAGR of 7.5%**.
- The Embedded software finds **applications across the following sectors**: Automotive, Aerospace & Defence, Rail & Transportation, Energy & Utilities, Industrial, Consumer Electronics, Life Science, Telecom, Semiconductor, Media & Entertainment, and Software & Internet (Enterprise software and Consumer software).

Key Growth Drivers

- **Rising disposable income** has increased the demand for consumer electronics such as smartphones, wearable devices, and tables, fueling the market growth.
- Increasing research & development initiatives by automotive OEMs **toward ADAS and self-driving cars** are expected to spur the industry growth.
- Energy utility companies are shifting to **smart meters** to reduce power consumption, improve operational efficiency, and enable dynamic pricing for consumers.
- **Government initiatives** to boost the growth of the Embedded Software Market.

Key Trends

- Increasing requirements for safety & comfort features in vehicles have led market players to focus on developing **high-end automotive software and electronic systems**.
- The **demand for advanced point-of-care medical devices** witnessed a drastic increase due to COVID, and the increasing government initiatives to support medical device manufacturers to boost the production activities during pandemic.
- **High customization and user-friendly interface** offered by major GPOSs*, such as Android, Linux, and Windows, are further augmenting their adoption in consumer electronics.
- The standalone functionality in embedded software helps application-specific hardware systems to achieve **higher execution rate, improve efficiency, and optimize the productivity**.
- The embedded software helps to efficiently manage and run telecommunication base station base station equipment (servers, routers, modems, and communication modules) for 24/7 operations without downtime and helps in process control operations.

Key Players

intel   ENEA   Green Hills SOFTWARE   IBM   Microsoft   MICROCHIP   MITSUBISHI

ST life.augmented   expresslogic   LG CNS   Mentor Graphics   ni   SEGGER It simply works!   HCL

TEXAS INSTRUMENTS   RENESAS   Qualcomm   TOSHIBA   via   NXP

Source: Globe Newswire, PR Newswire, Grandview Research, WBOC, Markets & Markets, Gmin Insights, Data Intelo
Note: *GPOS - General Purpose Operating System. The key players were curated based on players across different sectors (Automotive, Aerospace & Defence, Rail & Transportation, Energy & Utilities, Industrial, Consumer Electronics, Life Science, Telecom, Semiconductor, Media & Entertainment and Software & Internet) and are not exhaustive.

AGENDA

01	**Embedded Software/System Ecosystem**

02	**Investment Overview of Embedded Software**

This section provides an overview of:

- Major investments in embedded software industry by key players across verticals

03	**Key Challenges in Embedded Software Industry**

04	**Vertical Sectors Analysis**

05	**Key Players Deepdive**

06	**Key Focus Areas**

Topics covered only in the Full Report

Company	Associated Industry	Partner(s)	Investment Year	Invested Amount (USD)	Investment/Deal Type	Description
BOSCH / Continental	Automotive	RECOGNI	2021	48.9 Million	Autonomous Vehicle Design and Deployment	• Bosch and Continental Invested $48.9 Million in Recogni to develop an **AI-powered vision cognition module (VCM)** to recognise other vehicles and road users and obstacles immediately and with the utmost certainty in poor environmental conditions.
intel	Semiconductor	-	2021	3.5 Billion	Semiconductor Packaging Technology	• Intel invested $3.5 Billion to manufacture advanced semiconductor packaging technologies, including Foveros, Intel's 3D packaging technology, to meet **increasing computing performance needs** for advanced technologies.
Qualcomm	Consumer Electronics	-	2021	Undisclosed	Platform for Wearables	• Qualcomm Technologies invested in its Snapdragon Wear Platform to launch the **Qualcomm Wearables Ecosystem Accelerator Program**. • It comprises device manufacturers, service providers, platform players, independent hardware and software vendors (IHVs and ISVs), and system integrators who will work with OEMs **to develop and commercialize products and solutions**.
Microsoft	Healthcare	NUANCE	2021	19.7 Billion	Healthcare Cloud	• Microsoft invested $19.7 Billion in healthcare cloud strategy by purchasing Nuance Communications to leverage Nuance's voice recognition, AI, and natural language processing to help **refine the nascent Microsoft Cloud for Healthcare**.
NXP	Automotive	KALRAY	2020	9 Million	Autonomous Driving Solutions	• NXP Semiconductors invested in Kalray to develop **safe, reliable, and scalable solutions for autonomous driving**, combining NXP Automotive solutions and Kalray MPPA (Massively Parallel Processor Array) Intelligent Processors.
ENEA	Software & Internet	-	2014	3 Million	OSE* Compatibility Platform	• ENEA invested $3 Million over four years to deliver Enea Linux and Enea OSE* and an OSE* Compatibility **Platform for running OSE applications in Linux**.
European Commission	Aerospace & Defence	THE Open GROUP	2011	4.12 Million	Complex Real-Time Systems in Aerospace & Defence	• The European Commission (EC) invested $4.12 Million in The Open Group to develop a new, regional, model-based software development framework for **complex real-time systems in aerospace and defence**.

Source: Company Newsroom, Blogs, Whitepapers, Case Studies
Note: *OSE - Open Systems Environment. The investments were considered for past 10 years. The above-mentioned investments are not exhaustive

AGENDA

| 01 | **Embedded Software/System Ecosystem** |

| 02 | **Investment Overview of Embedded Software** |

| 03 | **Key Challenges in Embedded Software Industry** |

| 04 | **Vertical Sectors Analysis** |

| 05 | **Key Players Deepdive** |

| 06 | **Key Focus Areas** |

This section provides an overview of:

- Key challenges in embedded software industry across verticals such as
  - Automotive
  - Aerospace & Defence
  - Rail & Transportation
  - Energy & Utilities
  - Industrial
  - Consumer Electronics
  - Life Science
  - Telecommunications
  - Semiconductor
  - Media & Entertainment
  - Software & Internet

Topics covered only in the Full Report

Key Challenges & Solutions of Embedded Software

	Automotive	Aerospace & Defence	Rail & Transportation
Challenges	• Highly sophisticated state-of-the-art **open-loop and closed-loop control concepts** are essential for meeting the demands for function, safety, environmental compatibility, and convenience. • The automotive industry is facing the challenge of the **rapidly growing significance of software** and software-based functionalities. • The effective application of electronics technology is vital to the automotive industry as **viable solutions** for improved drivability, enhanced safety features, less environmental burden, greater operational reliability.	• Any component that appears in an embedded system will need to be **IPC* compliant** for the entire system to meet IPC* and MIL* standards. • Embedded systems for portable/mobile military require **power management capabilities** that appear directly on-board. • Alongside onboard processing and power management capabilities, devices will need to have some onboard memory and managed properly to ensure functionality. • Growing demands for **increased connectivity** and new services are introducing new security threats and new vulnerabilities for unmanned aircraft embedded systems.	• Brake and traction control systems must ensure that it is possible to **use and maintain the brakes** as efficiently as possible. • A lot of meta-data gathered is partly used by the system to adjust itself, while other data must be propagated to other systems analyzed elsewhere. • Packed platforms and high demand for seats make it daunting to maneuver through a busy station and travel on a train. • **Driver display systems** (or screen boards) are becoming more and more complex while integrating highly critical with commodity functions.
Solutions	• The evolution of technologies, the need of the day supplemented with global standardization, has increased research potential in the domain. • Since the subsystem and automobile subjected are **numerous and unique**, it has necessitated automated test systems. • The **AUTOSAR* development partnership**, which includes several OEM manufacturers, Tier 1 suppliers, and tool and software vendors, has been created to develop an open industry standard for automotive software architectures.	• Commercial aviation companies are looking **to bring vast arrays of near-real-time data and operations** into business operations to benefit customers and improve product and service delivery and development. • Solution providers have developed platforms to meet the needs of **next-generation military networks**. • These include serving high-bandwidth, high-performance applications that cannot experience downtimes such as land- or ship-based control systems, sensor data compute farms, and surveillance systems.	• The brake and traction control systems' basic functionality – controlling the brakes are implemented through a PLC* **to shorten time-to-market and reduce implementation complexity** and certification efforts. • **Safety-critical user interface components** focus on a leaner approach to reduce the risk and cost of the certification. • Investment in **digitalizing railway systems** will ensure that the rail network can respond to growing demand and deliver safe, efficient, and on-time passenger services.

Source: Company Newsroom, Blogs, White papers, Solutions by providers related to Automotive, Aerospace, Defence, Railways, Transportation
Note: *IPC – Infection, Prevention and Control, *MIL – Military, *AUTOSAR – Automotive Open System Architecture, PLC – Programmable Logic Control

AGENDA

01	**Embedded Software/System Ecosystem**
02	**Investment Overview of Embedded Software**
03	**Key Challenges in Embedded Software Industry**
04	**Vertical Sectors Analysis**
05	**Key Players Deepdive**
06	**Key Focus Areas**

This section provides an overview of:

- Applications of embedded software across verticals

- Key initiatives across verticals such as

  - Automotive
  - Aerospace & Defence
  - Rail & Transportation
  - Energy & Utilities
  - Industrial
  - Consumer Electronics
  - Life Science
  - Telecommunications
  - Semiconductor
  - Media & Entertainment
  - Software & Internet

Topics covered only in the Full Report

Automotive

draup

Applications of Embedded System in Automotive

Embedded Airbag System

- The Airbag system provides extra protection against a **head-on collision**.
- This system works on the commands from the microcontroller, which gets the power from the battery.
- If the sensors detect an accident, this microcontroller operates the airbag system **by operating an alternator**.

Embedded Navigation System

- This navigational system consists of an **embedded circuitry** built with a GPS receiver, a gyroscope, a DVD-ROM, the main controller, and a display system.
- The Gyroscope and other sensors provide the road **direction and speed**. From all the information gathered at the main controller, the display system displays the destination's navigation or route map on the screen.

Adaptive Cruise Control (ACC)

- The adaptive cruise control allows cars **to keep safe distances from other vehicles** on busy highway roads.
- The driver can set the speed of his car and the distance between his car and other vehicles. When the traffic slows down, ACC changes vehicle speed **using moderate braking**.

Embedded Rain-Sensing System

- In this system, an optical sensor is placed on a small area of the front windshield glass (opposite the rear-view mirror).
- This optical sensor is placed at an angle **to emit infrared light**, which reads the amount of light when the light is reflected.

Embedded Automatic Parking System

- This automatic parking system is an **independent car manipulation system** that moves a car from a traffic lane into a parking spot to perform parallel parking, perpendicular parking, and angle parking.

Automotive

Case study: Adaptive Cruise Control

OSRAM Opto Semiconductors   **JOYSON** SAFETY SYSTEMS

Osram Opto Semiconductors collaborated with Joyson Safety Systems to equip the new Cadillac CT6 with an innovative system for semi-autonomous driving.

- 'Super Cruise' is the industry's first true hands-free driving technology for the highway and represents the next evolution of adaptive cruise control and works only if the driver is paying attention to the road ahead.
- Osram's infrared and LED components, which are embedded in Joyson Safety Systems' steering wheel for the Cadillac CT6, allow the system to monitor driver attentiveness by tracking his or her head position to ensure drivers are watching the road ahead while 'Super Cruise' is engaged.
- If the driver looks away from the road for too long, the 'Super Cruise' system will send a series of alerts for the driver to resume supervision of the road.

Source: Watelectronics, Siemens blog, Vector, Osram Case Study

draup

Automotive

External Airbag

ZF

Developed external airbags housed along the bottom sill of a vehicle's body are connected to a host of sensors that can detect the movement outside the vehicle and sense an oncoming side impact before deploying the system.

Automotive Forward Camera Solution

XILINX   MOTOVIS

Partnered to pair the Xilinx Automotive (XA) Zynq system-on-chip (SoC) platform and Motovis' convolutional neural network (CNN) intellectual property (IP) to provide a solution for forward camera systems' vehicle perception and control.

Adaptive Cruise Control

Maserati

Developed Adaptive Cruise Control with Stop & Go function, which applies the brakes and brings to a complete stop if the vehicle ahead stops in front of you, and then resume driving the car autonomously if the stop is less than two/three seconds.

Vehicle Safety and Security

BlackBerry

Developed Blackberry QNX software that helps automakers and Tier 1s design and develop high-performance, safe, secure, and reliable software for traditional ECUs, as well as next-generation ECUs and domain controllers.

Microcontrollers for Airbags

CYPRESS
EMBEDDED IN TOMORROW

Developed microcontroller named MB91520 equipped with a rich multi-function serial interface that can communicate with the airbag control IC and multiple sensors.

Embedded Navigation

TOMTOM

Developed an In-Dash navigation system that delivers a high-quality end-user experience and switches to its onboard software when no data connection is available.

Tactical Sensing Software

BMW   TACTILE MOBILITY

Partnered to equip future BMW vehicles to analyze the road surface under the tires, enabling accurate detection of real-time road conditions and support adaptive suspension management functions to enhance safety and performance.

Predictive Maintenance

intellias

Developed Automotive Embedded Software to get valuable insights into vehicle performance and driver behavior and allow manufacturers to schedule corrective actions and maximize the equipment operation.

Real-Time 3D In-Vehicle Experiences

unity   here

Collaborated to combine automotive-grade map data and services elements with an advanced real-time 3D engine that brings dynamic, high-end design capabilities to the automotive user-experience.

Source: Economic Times, Blackberry Press Release, BMW Press Release, Intellias Solutions, Cypress Newsroom, Here Press Release
Note: *ECU – Electronic Control Unit

—— Partnership   —— Inhouse

AGENDA

01	**Embedded Software/System Ecosystem**
02	**Investment Overview of Embedded Software**
03	**Key Challenges in Embedded Software Industry**
04	**Vertical Sectors Analysis**
05	**Key Players Deepdive**
06	**Key Focus Areas**

This section provides an overview of:

- Key Initiatives (Partnerships, Acquisition, In-house developments) of Embedded Software key players across verticals such as

  - Automotive
  - Aerospace & Defence
  - Rail & Transportation
  - Energy & Utilities
  - Industrial
  - Consumer Electronics
  - Life Science
  - Telecommunications
  - Semiconductor
  - Media & Entertainment
  - Software & Internet

Topics covered only in the Full Report

Automotive

Bosch: Bosch focuses on in-house initiatives & collaboration with technological companies to provide safe mobility, comfort user experience and improved quality

BOSCH

Robert Bosch GmbH is a multinational engineering and technology company which operates in sectors of Mobility, Consumer goods, Industrial technology & Energy and Building Technology.

Year of Establishment:
1886

Headquarter:
Stuttgart Area, Germany

Revenue (2020):
$ 82.76 Billion

Chairman of the Board of Management:
Dr. Volkmar Denner

Key Initiatives

Accident-Free Mobility

- Bosch actively involved in the initiative called "Stop The Crash" by promoting the prevalence of Electronic Stability Program(**ESP)**, Automatic Emergency Braking(**AEB)** and Anti-lock Braking System**(ABS)**.
- Passive safety systems like airbag and seat belts also helps to reduce number of fatalities and injuries.

Mahindra Rise.   **AdrenoX Technology**

- Mahindra collaborated with Bosch to develop a connected system with additional features for **XUV700 AdrenoX.**
- It offers top features like enhanced safety, convenience and comfort with remotely control windows, In-car connectivity and 24*7 access to vehicle data and dashboard.

IoT Based Blockchain Technology

- Bosch initiated an **innovative IoT solution for tracking system** called **Trac360,** which enables real time shipment and track parts.
- Use cases are container management, Assisted user experience, condition monitoring and real-time tracking.

Microsoft   **AI & Cloud**

- Bosch joint ventured to develop vehicle software that combines **Automotive and cloud computing with AI**.
- This collaboration will benefit a deep understanding of electrical & electronic architectures, control units and vehicle computers.
- As in smartphones, this will create conditions for wireless updates and reduce complexity of software.

Associated Service Providers

HCL   **wipro**   **Infosys**   **brigosha**   **Mindtree**   **Technosoft CORPORATION**   **CYIENT**   **DATAMATICS Data to Intelligence**   **L&T Technology Services**

Source: Bosch press, carwale , Bosch annual report
Note: The key leaders were curated based on digital technology expertise and are not exhaustive.

TOSHIBA

Toshiba corporation is a multinational multi-industry company, one of biggest manufacturers of personal computers, consumer electronics, home appliances and medical equipment

Year of Establishment:
1875

Headquarter:
Tokyo, Japan

Revenue (2021):
$ 27.24 Billion

President and CEO, Toshiba Digital Solutions Corporation:
Taro Shimada

Key Initiatives

DENSO   **AI Technologies**

- Toshiba collaborated with DENSO to combine with its high-level technology and **IoT-based manufacturing capability**.
- This collaboration enhanced AI-Technology for advanced driver assistance & automated driving, development of automotive Lithium-ion battery packs and software for ECU.

Simulation Technology

- Toshiba initiated new simulation technology for model-based development **that shortens verification time** for automotive semiconductors by about 90%.
- This model automatically generates VHDL-AMS, eliminating unnecessary parameters while evaluating the electric circuit and further shortening the verification time.

Automotive Motor Drivers

- Toshiba launched 5A 2ch H-Bridge motor drivers for automotive applications, including **electronic throttles**.
- These motor drivers are applied in throttle valves, various engine valves, retractable door mirrors, electric door latches and body system.

Gestamp   **High-Precision Detection**

- Toshiba Joint ventured with Gestamp to **bring advanced monitoring and analysis** to the welding of vehicle chassis parts.
- Here **AI Technology** is used to find welding failures from data, and AE(acoustic emission) sensors identify the quality through camera images.

Associated Service Providers

CPS TECHNOLOGIES   DELL   Infosys   wipro   Capgemini   tcs TATA CONSULTANCY SERVICES   accenture   IBM

Source: Business wire, Toshiba news release, green car congress
Note: The key leaders were curated based on digital technology expertise and are not exhaustive.

Continental — The Future in Motion

Continental AG is a multinational automotive parts manufacturing company specializing in the brake system, interior electronics, automotive safety, powertrain, chassis components and other parts of transportation and automotive industries

Year of Establishment:
1871

Headquarter:
Hanover, Germany

Revenue (2020):
$ 42.62 Billion

Member, Vehicle Networking and Information:
Helmut Matschi

Key Initiatives

aws Automotive Software

- Continental collaborated with AWS **to develop a software and hardware platform** that connects the vehicle to the cloud, which creates a virtual workbench to maintain software-intensive functions.
- Computing capacity offered by AWS helps this platform to transfer data and training algorithm in few seconds.

KOPERNIKUS AUTOMOTIVE Automated Valet Parking

- Continental collaborated to Kopernikus Automotive to develop AI-based automatic parking system **without a driver**.
- This autonomous vehicle parking procedure is based on vehicle sensor data and a solution based on intelligent infrastructure.

iteris Intelligent infrastructure

- Continental joint ventured with Iteris to explore Intelligent Infrastructure for **safer and more efficient roads**.
- The collaboration supports needed infrastructure changes for smart mobility **as automated vehicle demand sensing, connectivity and communication capabilities**.

CU–BX Driver Monitoring

- Continental joint ventured with CU-BX to develop automotive contact-free occupant health and well-being detection.
- This monitoring system **detects the parameters for safety and comfort** using artificial intelligence which delivers the information.

Associated Service Providers

wipro · HCL · Mindtree · Infosys · L&T Technology Services · Luxoft (A DXC Technology Company) · Tech Mahindra · Capgemini

Source: Continental.com, PR news wire, annual report
Note: The key leaders were curated based on digital technology expertise and are not exhaustive.

draup

www.draup.com

info@draup.com

SANTA CLARA I HOUSTON I BANGALORE I GURGAON I COIMBATORE I NEMILI