

Exporting embedded systems for telemedicine to the United Kingdom

The UK is one of the leading markets for embedded systems in Europe. In terms of software revenues, the UK is the second-largest market in Europe. Exporters from developing countries have opportunities in terms of entering the UK with better-priced, customised hardware and software. The ability to offer a customised product design is a key driver in this product category.

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1. Product definition

The typical embedded systems sold in western Europe for industrial applications are motherboards, single board computers and system on module. The product range includes microprocessors (HS code 85421355), microcontrollers (HS code 85421360), microcomputers (HS code 85421966), digital signal processors (HS code 8541500), peripheral systems (HS code 85422161), network sub-systems (HS code 85421200), interfaces (HS code 85422970), memories and memory peripherals (HS code 8542320), memories for other uses (HS code 85421940) and other system solutions (HS code 8542500). Embedded software and embedded hardware are often sold as one product.

Embedded systems are used in many industrial applications, including automotive, automation and energy. Use of embedded systems in the automotive industry has been growing significantly. Specifications for embedded systems vary depending on the solution, its complexity and the application industry.

The major suppliers of embedded systems in Europe are Advantech, Intel, Kontron, DATA MODUL, Phoenix Contact, Wago Kontakttechnik, Micron Technology, Commell, BVM, Congatec, Digi International, VIA Tech, Emerson Networks and Fortec. The brand names of embedded systems have a higher importance compared to other electronic components.

2. Product specifications

Quality:

European companies are typically looking for embedded systems that fulfil the agreed-upon specifications between the supplier and the buyer, are energy efficient and have up-to-date technology.

- Embedded systems are characterised by the interface, platform, peripherals and other tools. Embedded systems may also vary in terms of system complexity. Complex embedded systems may include connectivity to a network, a touch screen, real-time computing, etc.
- Embedded systems are used in highly innovative environments/industries. The ability to offer a customised product design is a key driver in this product category. Customised solutions are required in automotive, automation, military, health care and other application industries. Customisation may include integration or

development of software for existing hardware assemblies, presenting cost benefits for exporters from developing countries because of easier/no shipping.

- Product quality is typically measured by the materials used and by the implemented know-how or engineering skills. Branded products such as Intel, Advantech and Congatec have a big influence on the European market, and can serve as a benchmark for new entrants.
- For industrial applications, the reliability of embedded systems is more important compared to the consumer industry. Depending on the application industry, many embedded systems relate to user safety, for example in the automotive industry. Software for industrial applications has to be developed and tested more carefully compared to personal computers. You are advised to invest significantly in quality assurance.
- To ensure durability and safety, products must comply with the relevant EU regulations and standards. Materials used and especially hazardous substances have to comply with RoHS and must also meet REACH requirements (see Legislative Requirements in this report).

Labelling:

- Embedded systems are typically labelled with a description of the content, including the following information: type of product, model type, quantity, net and gross weight (in kilograms), supplier/manufacturer name and location, and serial number.
- Exporters from developing countries have to familiarise themselves with the energy-related product Directive entitled Waste of Electrical and Electronic Equipment (WEEE) in order to formulate labels, indicate all product information and mark products accordingly (for example, the symbol of the crossed-out wheellie bin).

Packaging:

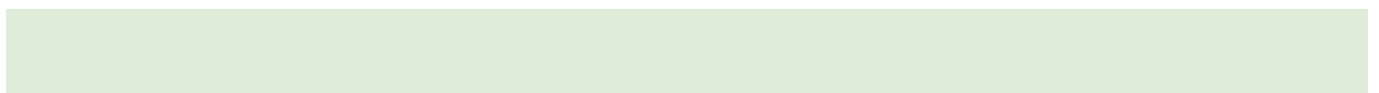
- Embedded systems (hardware) are typically packaged in plastic bags and cardboard boxes to protect them from damage.
- Software can be saved and shipped as a CD or DVD, and no specific packaging is required.
- In many cases, software is integrated in hardware already, therefore traditional packaging is required (for example plastic bags and cardboard boxes).

Which market opportunities for exporters of embedded systems does the UK market offer?

With the above average demand for embedded systems in Europe, the UK is an attractive market for exporters from developing countries. Exporters from developing countries can supply UK companies with customised hardware and software solutions, as well as launch software testing services. Exporters from developing countries may consider cooperating with small and medium-sized companies, where the Software-as-a-Service market is set to grow faster than larger organisations.

In 2015, the performance of both automotive and industrial sectors in the UK improved again, impacting the embedded systems industry and the relevant software companies. The UK is the second-largest market in terms of software revenues, accounting for nearly 15% of the total software revenues in Europe. The embedded systems sector is boosted by the growing support of the EU and the UK government, as the need for innovative technologies across all application industries grows.

Demand for embedded systems is driven by the growing amount of electronic content in automotive applications, the growing energy demand and renewable energy development, as well as the medical sector. There are more than 3,000 companies in the UK medical devices sector, with a turnover of more than £13 billion. According to estimations of the National Audit Office, around 70% of the machinery of the National Health Service (NHS) will be replaced between 2015 and 2020, creating business opportunities for companies.



Tips:

Exporters from developing countries will benefit by offering better-priced, labour-intensive products (customised hardware and software) to support the ongoing innovation process in the UK.

Consider entering the UK market not only with hardware but also with software solutions, which is a rapidly growing segment.

Think of working together with small and medium-sized businesses rather than larger software companies in the UK.

Expand your existing service proposition to include software testing, in order to benefit from the outsourcing trend in the market.

3. Outsourcing provides new growth opportunities

Exporters from developing countries have opportunities to enter the UK with a value-for-money proposition in relation to embedded system hardware and software. Outsourcing is set to become the fastest-growing area in the UK software testing market. Many UK organisations already outsource software testing functions in order to cut the cost of developing and maintaining applications.

The import of embedded systems to the UK was hit by the slowing demand in application industries, especially in the automotive industry. Embedded systems have also become less expensive (for example, Raspberry miniature computers) and this has influenced the value of demand. Many UK organisations outsource software testing functions in order to cut the cost of developing and maintaining applications. Outsourcing is set to become the fastest-growing area in the UK software testing market, growing at an average of 10% between 2011-2015. At the same time India's software share — as a highly competitive and rapidly evolving software market — is expected to grow from 20.5% in 2013 to 24.5% in 2017, while its share of hardware will go down from 47.4% in 2013 to 41.1% in 2017.

Exporters from developing countries have opportunities to supply the UK market not only with embedded systems hardware but also with software solutions and/or software testing services (the growth area within outsourcing in the UK).

Tip:

Expand your existing service proposition to software testing in order to benefit from the outsourcing trend on the market. See our studies of the [IT Outsourcing sector for more information](#).

4. What trends on the UK market offer opportunities?

Product separation by the level of technological advancement:

European Original Equipment Manufacturers (OEMs) separate high-tech and low-tech, or high-price and low-price electronic product parts. For example, in the automotive industry, hardware (low-price) and software (high-price) are split according to the retention of intellectual property rights; for example, by keeping software development in-house and purchasing hardware from suppliers from developing countries.

Miniature electronic products and integration of functions:

There is a shift towards the development of miniature electronic products for safer and more exact works; for example, miniature robots used for installation and test purposes (can be applied for catastrophes/in disaster regions) or in miniature computers.

Some of these miniature products are not only smaller in size but also cheaper (for example, Raspberry). Apart from this aspect, the integration of diverse functions into space-optimised applications is popular, as it not only reduces size but also material costs.

Exporters from developing countries will benefit by supplying European countries with value-for-money solutions in the embedded systems segment, especially when companies are increasingly looking for options to cut costs (for example, by outsourcing software testing services).

Product reliability:

For industrial applications, the reliability of embedded systems is more important than it is in the consumer industry. Depending on the application industry, many embedded systems relate to user safety, for example in the automotive industry. Software for industrial applications has to be developed and tested more carefully compared to personal computers.

Minimisation of the total cost of ownership:

With the growing role of international cooperation, European companies will increasingly have to face various risks that need to be measured and managed in order to keep the total cost of ownership (TCO) at a reasonable level. Both smaller and larger companies will increasingly look for the most reliable suppliers and will try to eliminate risk through supplier contract and cost management.

European SMEs present better opportunities as potential customers for exporters from developing countries, but larger companies may also contact you as a potential supplier. That is why visibility on the market is crucial.

Tips:

Create a product portfolio on a modular basis, allowing customers to order a low-tech electronic part separately (for example, hardware without software) or in combination with high-tech electronics (hardware including software).

Consider differentiating and specialising in embedded systems for miniature electronic products.

Meet safety and quality demands by integrating a quality assurance programme in your production process.

Invest significantly in quality assurance and test all your solutions carefully. Products made by Advantech, Intel, Commell can serve as a benchmark in embedded systems for exporters from developing countries.

Develop your sales and marketing strategy: work on well-structured and up-to-date content on your company's website; attend trade fairs several years in a row; start preparations for the trade fair far in advance (see a list of trade fairs in the Useful Sources list); work on your *Unique Selling Proposition*; i.e., why European OEMs should buy your product.

Work on the product pricing.

5. How do macroeconomic aspects impact the UK market?

The UK economy has recovered and returned to growth. Since 2011, the country has reported a steady growth path that stimulates investments, including those in the electronic and medical sectors. The impact of the Brexit (the UK leaving the European Union) on the country are difficult to predict, as the process will last two years and negotiations of alternative trade agreements have yet to start.

See [our study of trends in the Electronics and Electrical Engineering sector](#) for more information.

Tip:

Keep an eye on the developments regarding the UK leaving the EU, the so-called Brexit. It might influence the overall economic development in the UK.

6. What requirements should embedded systems comply with to be allowed on the UK market?

To assure durability and safety, products must comply with the relevant EU regulations and standards. Compliance with European legislative as well as non-legislative requirements is a basic necessity for all exporters in the electronics and electrical engineering sector. Below, you will find the main mandatory requirements for your products. Make sure that you have familiarised yourself with legal requirements in terms of labelling, dangerous substances, product safety and liability. Your products must comply with all EU directives. For the time being, it can be expected that the Brexit will not lead to fundamental changes in the requirements.

1. CE marking

For intra-European trade, all embedded systems must be marked with the CE mark. This shows that the product was assessed before commercialisation and that it meets EU safety, health and environmental protection requirements. For embedded systems, the most important Directives on CE marking are:

- Electromagnetic compatibility (EMC Directive 2004/108/EC),
- Low-voltage equipment (LVD 2006/95/EC),
- Eco-design for energy-using products (Directive 2009/125/EC), which are not standards but implementing measures,
- RoHS (see below).

For software used in medical devices, the following Directive on CE marking is important:

- Medical devices (Directive 93/42/EEC).

[The European Commission page on CE marking](#) is a useful starting point to find out how the legislation on CE marking is relevant to you; it illustrates the key steps that you need to take in order to comply with and obtain CE marking for your products.

Tips:

Comply with the CE marking for all your products before approaching potential customers in the UK.

Familiarise yourself with [low-voltage equipment](#) (LVD) and [electromagnetic compatibility](#) (EMC) standards that apply to embedded systems.

Apply for the CE marking for software that is used in medical devices.

2. Chemicals

Use of certain chemicals is restricted by the EU and is regulated through several Directives and Regulations.

Restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)

The Directive sets maximum levels for lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) or polybrominated diphenyl ethers (PBDE) in electronic equipment (0.01% by weight for cadmium and 0.1% for the other substances). The [Directive](#) covers all embedded systems with the exception of the products mentioned in [Annex III](#) to the Directive. Since 2013, CE marking has been required in relation to RoHS compliance of final products. This includes technical documentation and a declaration of conformity.

REACH Regulation

This legislation restricts the use of certain dangerous chemicals (as per [Annex XVII of the Regulation](#)) and sets requirements on indicating information about the chemicals used. Manufacturers are required to provide information to their buyers on the properties of chemical substances used.

Tips:

List all chemicals, including raw materials and additional materials, used in your production process.

Check the candidate list of [Substances of Very High Concern](#).

Fill out this information in the form required by your EU buyer, for example, by providing information in Material Safety Data Sheets (MSDS) or software in which you declare the chemical content of your product (for example, [BOMcheck](#), a collective data system developed by a group of large electronics companies to collect chemical composition information from suppliers).

Provide the EU buyer with technical documentation and a declaration of conformity for the products supplied.

3. Waste of Electrical and Electronic Equipment (WEEE)

If you want to export embedded systems to the UK, be aware that your EU producers are obliged to participate in product take-back schemes. This does not directly affect exporters from developing countries, but specific requirements on the design may be set in order to facilitate the reuse and recycling set out by WEEE.

Tip:

Familiarise yourself with information published in [the EU Export Helpdesk](#) to have a better understanding of [WEEE requirements](#).

7. Common Buyer Requirements

Quality management systems (QMS)

If you plan to export to Germany, all products must meet buyers' quality demands. ISO 9001 and 14001 are

designed to make sure that the manufactured and/or exported products to Europe meet customer needs. Compliance with [VDE](#) (a German standard with several variations) is often also required by UK buyers.

Tips:

Apply for [ISO 9001](#) as quickly as possible and plan for [ISO 14001](#).

Familiarise yourself with VDE requirements. The latter standard is particularly important when entering the UK market.

Consider forming a Quality Assurance team within your company that will assure the high product quality required by EU buyers.

Corporate Social Responsibility (CSR)

UK buyers increasingly look for products that have been manufactured with due respect for human rights, labour conditions and the environment. Bigger EU companies even develop their own CSR policies and require the suppliers to conform to these requirements. In particular, workers' health and safety are sensitive topics in Europe and buyers want to avoid reputation loss.

Tips:

Understand what CSR policies are required by your customers by checking websites of electronic companies in the UK.

Consider implementing Occupational Health and Safety (OHS), which deals with aspects related to labour conditions. These requirements are not mandatory, but they will definitely give you an advantage over other competitors.

British Standards Institution (BSI) published standards in the electrical and electronic industry in the UK. British national standards are harmonised with European and International Standards, and define best practices and requirements for the design, use, installation and specifications of electric and electronic components. The application of standards is generally voluntary. However, for medical, toy, military and some other applications there are additional, country-specific standards which sometimes encompass different limits/requirements as compared to European standards.

You should primarily aim for global compliance, but also consider country-specific requirements. Even though UK requirements are not mandatory, they will definitely give you an advantage over other exporters from developing countries. The decision regarding whether to apply for country-specific standards can be driven by the application industry that you're aiming for. In addition, Waste of Electrical and Electronic Equipment standards are regulated on a country level.

Tips:

Familiarise yourself with UK standards, if you plan to enter this market.

See the [BSI](#) webpage for more information on national standardisation in the UK.

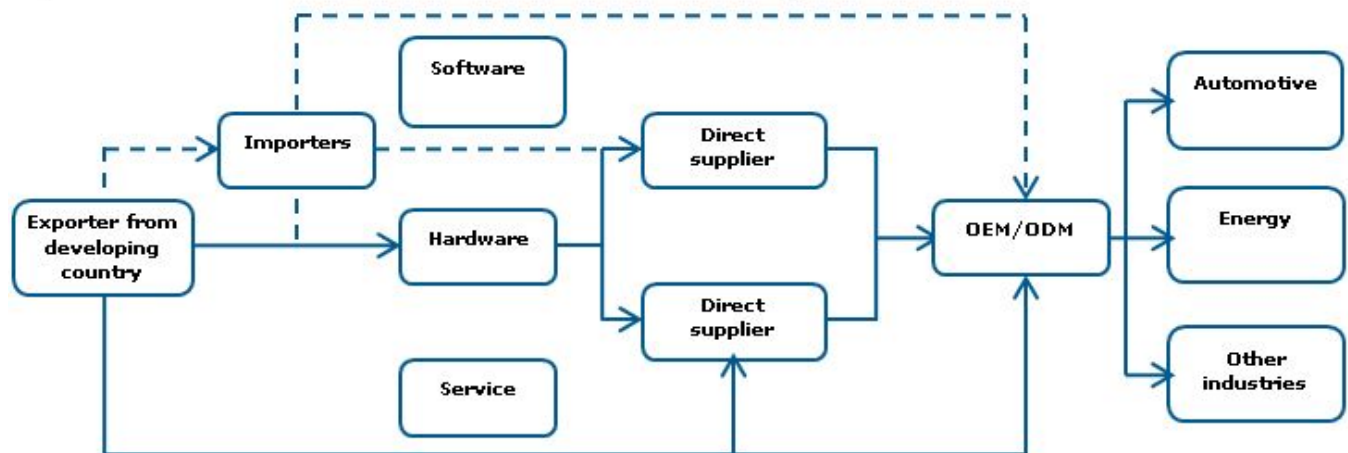
8. What competition do I face on the UK market?

See our study of [competition in the Electronics and Electrical Engineering sector](#) for more information.

Through what channels can you get embedded systems on the UK market?

Exporters of embedded systems from developing countries can enter the EU market by partnering with hardware suppliers, by providing to direct suppliers or by delivering directly to OEMs/ODMs. It is also possible to go the indirect way through cooperation with importers, which will use their existing channels to sell the exporter's product. With the growing importance of service, supplier reliability and product safety, OEMs are increasingly choosing the indirect supply chain for software and hardware solutions. After-service also plays an important role; therefore, a local footprint is required in order to meet customer requirements and provide on-site customer support.

Figure 6: Channels for the product sub-segment Embedded Systems



European OEMs are increasingly separating hardware and software, usually by keeping the intellectual property rights — i.e., software development — in-house and purchasing hardware from suppliers from developing countries. Hardware suppliers (unlike software suppliers) have opportunities in approaching OEMs directly.

Exporters of embedded systems from developing countries should consider cooperation with local embedded providers, who can provide customers with a value-added service and on-site support. Another option is to approach OEMs/ODMs directly through a local office in the target country, but this option is quite costly and risk-intensive.

Exporters from developing countries who specialise in hardware solutions should consider approaching OEMs from automotive, energy and other industries directly. However, this applies to large companies only.

See our study of [segments and channels in the Electronics and Electrical Engineering sector](#) for more information.

Tips:

Cooperate with European embedded system providers by contributing components.

Concentrate on offering better-priced, labour-intensive products; for example, customised hardware.

9. What are the end-market prices for embedded systems?

Embedded systems have a large variation of specifications and include a number of product groups. Approximate price ranges of the key product groups (motherboards, single board computer and system on module for industrial application) are indicated in the table below. Thus, a system on module may cost from €250 to €1300 in Europe, depending on the system specifications and complexity. The price can also vary depending on the product brands and the supplier.

Table 1: Prices of embedded systems

Main groups of embedded systems for industrial application	OEM volume price range, in €
Motherboards	€ 50-150
Single board computer	€ 75-900
System on module	€ 250-1300


Producers from developing countries have to be aware of different costs and value chain margins that add up to the product price. Production and administration costs of the manufacturer usually make up 44-51% of the end price (OEM volume price). The production and administration costs should include all raw material costs, development, labour, and other fixed and administration costs. To make a unique selling proposition, exporters from developing countries have to understand their own costs, liabilities and responsibilities, and analyse product market price levels.


Table 2: Breakdown of prices


OEM volume price breakdown	Margin
Production and administration costs	44-51%
Marketing and sales costs in developing countries	3%
Freight to Europe and other related costs	6%
Import and other costs (for example, VAT, financing)	5%
Marketing costs in Europe	7-10%
Importer margin	5-7%
Distributor margin	10-20%

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