The European market potential for (Industrial) Internet of Things

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The European market for Internet of Things (IoT) solutions is accelerating. Germany, the United Kingdom and the Netherlands are leading European IoT adoption, but Eastern European countries and the Nordics are following closely. The manufacturing, home, health and finance sectors are the front runners in IoT adoption, but impressive growth can also be found in the retail and agriculture sectors. The shortage of skilled specialists combined with the increasing openness towards outsourcing continues to drive outsourcing demand.

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1. Product description

The Internet of Things refers to everyday physical devices (things) that are connected to the internet. These things can, for example, refer to a connected:

- medical device
- biochip transponder (connected to for example livestock)
- solar panel
- car (sensors that alert the driver about issues concerning fuel, tire pressure, needed maintenance etc.)

These things send and receive data. Which makes data the harvest of applied IoT. This data can then be used for the optimisation of processes, monitoring of environments and performing of computations or mathematical calculations.

IoT can be divided into two categories: consumer IoT and Industrial IoT. Consumer IoT, often referred to simply as IoT, refers to devices for personal use. It is mostly used to improve consumers' daily lives by, for instance, making it safer, healthier or simply more enjoyable. Examples of such devices include wearable health and fitness monitoring devices, home automation appliances and connected vehicles.

Industrial IoT (IIoT), refers to non-consumer devices used by organisations, companies, governments and utilities, to enhance operations. The purpose of IIoT is to increase productivity, efficiency and safety, while decreasing waste throughout operations. Examples of IIoT devices include manufacturing equipment, robots and 3D printers.

Unless otherwise noted in this report, the term IoT shall be used to comprise both consumer and industrial IoT.

When is a device ‘smart’?

When IoT devices are connected with other devices and able to operate interactively and autonomously without human intervention, they are considered ‘smart’. Smart environments and devices can learn, operate autonomously, and offer expert advice. They are typical examples of how big data, artificial intelligence and IoT are integrated.

Examples of smart consumer devices are smartphones, smartwatches and smart televisions. When smart devices are linked to and integrated in everyday settings and tasks, then we speak of smart environments. Examples of smart environments in Europe are smart homes, smart cities, smart manufacturing, and smart industries.

IoT is closely associated with big data, Machine Learning (ML), 5G (the next generation of mobile data infrastructure) and artificial intelligence (AI). Higher bandwidths associated with 5G will allow more devices to connect to the internet. This in turn means that there will be greater data generation and processing capacity allowing companies to benefit even more from big data. As the availability of data continues to increase, this will further increase the demand for ML and AI.

What are IoT services?

The key revenue activities associated with IoT deal with:

- platforms
- applications and services
- IoT professional services
- connectivity
- big data solutions
- software services
- product development

In 2019, approximately 35% of IoT market value was generated from hardware, 27% from IoT services, 22% from connectivity and 16% from software. In 2021, the hardware segment share decreased to 30% and trends suggest it will continue to decrease. However, the value itself will grow, just not as much as the other segments, thus lowering the percentage.

2. What makes Europe an interesting market for IoT services outsourcing?

Europe is the third largest adopter of IoT after the Asia-Pacific region and North America. However, the annual growht of the European IoT market is in the double digits (more than 10%). What makes Europe particularly interesting next to its growing market size is that both consumer and industrial IoT offer opportunities and that these opportunities can be found in many vertical industries. The growing IoT market combined with skills shortages means there is extra room for outsourcing.

The European market continues to increase

As IoT becomes more mainstream, the related technology becomes cheaper and therefore more accessible to people and companies worldwide. Due to the considerable increase in the number of IoT devices, the IoT market continues to grow. European Internet of Things spending was estimated to reach €184 billion in 2021 (forecasted in 2021 and converted from USD). And it is expected to experience double-digit growth through 2025.

Even though experts expected the market to be put on hold temporarily because of the COVID-19 pandemic, the market never really slowed down significantly. On the contrary: IoT proved to be more relevant than ever. A global industry survey revealed that 84% of the respondents had accelerated, or intended to accelerate the

adoption of IoT in response to the challenges related to the COVID-19 pandemic.

According to IDC's Worldwide Internet of Things Spending Guide, in 2019, Europe was responsible for 23% of global IoT spending. Europe is herewith the third largest market after the Asia-Pacific and North American regions, which respectively account for 35.7% and 27.3% of worldwide IoT spending. However, the Asia-Pacific region saw the fastest growth (17%, followed by North America (15%) and then Europe (10%).

In 2021, there were more than 10 billion active IoT devices in the world. This number is expected to surpass 25.4 billion in 2030. By 2030, approximately 23% of the devices will be located in Europe. 26% in China and 24% in North America.

Tips:

- Move fast and build your capabilities and experience in IoT services now in order to establish a position in the IoT market while it is still heating up.
- Take a look at which calls to action are being taken towards 2025 to develop a stronger digital Europe.

Both consumer and industrial IoT offer opportunities

In 2020, consumer devices accounted for 63% of all IoT devices, with industrial devices accounting for the rest. This ratio is expected to remain the same in the coming years. This makes consumer IoT an interesting market for you but IIoT also offers good opportunities, as the spending is much higher. Although consumer devices comprise almost two-thirds of all connected devices, they only make up 19% of Europe's IoT expenditure. In 2019, revenues from the consumer segment were estimated at €28.5 billion.

For IIoT adaptation, the biggest concern remains a lack of in-house skills (38%), together with the lack of solutions (30%). This is a gap that IIoT service providers can tap into. The most in-demand skills that are needed for IIoT projects are:

- security skills (50%)
- analytical/data science skills (49%)
- technical support skills (48%)
- connectivity technology skills (47%)
- project management skills (42%)
- strategic skills (39%)
- procurement skills (33%)
- database management skills (27%

In the coming years, consumers are expected to purchase increasingly more expensive connected things, making the gap between consumer IoT and industrial IoT spending likely to decrease. Nevertheless, industries will remain the greater spenders.

An expected 60% of the connected devices will be cross-industry devices and 40% will be vertical-specific devices. Cross-industry devices are those devices that are used in multiple industries mainly to save costs, such as building management systems. Vertical-specific devices are used in specific industries, such as healthcare and manufacturing, to improve efficiency and accuracy.

Tip:

- Beware that many IoT technologies are rapidly becoming commodities, like mobile applications and

cloud computing did before, for example. This means your window of opportunity in new technologies, business models and market segments is limited.

There are many promising vertical industries

IoT is expected to affect all vertical European markets but markets that have traditionally invested more in IT are the front runners. Promising vertical industries for the next five years include:

Manufacturing

Research by McKinsey states that the manufacturing industry will account for the largest amount of potential economic value from IoT, growing to an estimated 26% in 2030. McKinsey believes that the greatest potential for value creation in the factory setting will be optimising operations in manufacturing. This means: making the various day-to-day management of assets and people more efficient.

Healthcare

According to the same McKinsey research, healthcare is the second largest industry, representing around 10 to 14% of the estimated IoT value in 2030. Over the past five years, the value of IoT solutions within healthcare has increased, both among healthcare professionals and customers. IoT solutions are not only used by individual customers. They are also provided by insurance companies and governments to improve health and to streamline the processes that patients go through. The COVID-19 pandemic has accelerated the use of IoT solutions in healthcare, as the world wrestled with both virus containment and a safe return to the workplace.

Healthcare is increasingly linked to big databases and medical advice is provided by doctors supported by artificial intelligence. Smart health is an explicit example of how IoT is linked with big data, artificial intelligence, machine learning and robotics.

Retail

The retail industry has witnessed a particularly significant growth over the last two years (2020 and 2021), mostly due to the massive expansion of the e-commerce industry. Read more about the opportunities in the retail segment in Exporting retail tech services to Europe.

Agriculture

The Agriculture IoT market is another very interesting vertical industry. According to research company Meticulous, the agriculture IoT market is expected to reach €20.4 billion* by 2028, at a Compound Annual Growth Rate (CAGR) of 10.8% from 2021 to 2028 (*converted from USD).

The growth of the agriculture IoT market is fuelled by the growing utilisation of precision farming techniques and the increasing adoption of IoT and cloud-based solutions and of course in increasing the understanding of the benefits that agriculture IoT can offer farmers. The major restraining factors for this industry are the lack of connectivity and infrastructure and the financial costs of IoT solutions for agriculture.

Despite the identification of these key markets, there are tangible business opportunities for IoT, cloud, artificial intelligence, machine learning and big data technologies across all smart environments, including smart cities, smart homes, smart utilities, smart transport and smart governments.

Tips:

- Even though currently the biggest value can be found in the Business to Business (B2B) sector, the value of Business to Consumer (B2C) applications is growing much quicker.

- Specialise in a vertical sector, or even better, on a specific niche market segment within a vertical market, which will give you a competitive advantage. Examples of such niche market segments within vertical sectors are smart farming, smart villages, smart customer experiences and smart warehousing.
- Follow the latest technological developments to keep your knowledge and skills up to date.
- There are several reports available that cover the impact of COVID-19 in various vertical IoT industries, examples are; the energy sector, healthcare and transportation, smart agriculture or smart cities.

Skills shortages and lack of expertise

As IoT continues to expand, there is an increasing need for specialised developers and specialists. Key skills include data visualisation, security solutions, Machine Learning, hardware expertise and the integration of all IoT elements. However, there is a considerable lack of IT training, certification, and experience in the European workforce. Due to the rapid technological innovations in IT, the skills of IT graduates do not match the needs of the market. A study 2021 by Udacity revealed that 59% of the researched enterprises report that not having enough skilled employees has a major or moderate impact on their business.

Initially skills shortages were common for Western and Northern Europe, but the shortages have now also become apparent in other areas in Europe such as Eastern Europe. Countries such as Poland, Bulgaria and Romania have grown to become common nearshore destinations for Northern and Western Europe, but they too are now facing skills shortages.

According to a survey conducted by sourcing company Randstad in 2021, the nine most in-demand IT skills are: artificial intelligence and machine learning, Augmented Reality and Virtual Reality, Blockchain, Cloud Computing, Cybersecurity, data science, IoT, Robotic Process Automation and User Interface/Experience Design. Seeing as these are all big areas of maturity, the situation is only likely to get worse. All these shortages have a relationship with and an impact on IoT.

Tips:

- Closely follow IT developments in your target countries. It is recommended to set up a Google alert and to follow large consulting companies, such as Kearney, Gartner, Deloitte, ATOS, Accenture and Capgemini. Signing up for newsletters from these firms is another way of retrieving relevant information.
- Develop consulting skills to advise potential buyers on how they can benefit from IoT and how you can help them with it. The earlier you are involved in the project, the better.
- Build up IoT expertise and an IoT team in your company. Offer solutions first locally and regionally to get references and confidence in your capabilities. Keep your skills up-to-date. If possible, obtain certification and clearly communicate you are certified in your marketing and client interactions.
- Read Stack Overflow's annual Developer Survey, that shows which developer skills are in demand and provides demographic information on software developers worldwide.

Specialisation in IoT offers opportunities

IoT offers a lot of opportunities for companies from developing countries to innovate and develop their own products. Apart from solely focusing on software development services you could develop your own IoT devices and hardware.

If you are offering outsourcing services for IoT software development, it is still software development, but IoT software development requires additional specialisation, including knowledge of hardware, sensors, data analytics and vertical market expertise, such as healthcare and manufacturing. But particularly specialisation in your choice of IoT development platform. Since IoT software development requires additional expertise, it could provide opportunities for service providers like you.

Tips:

Emphasise your expertise, experience and domain knowledge in your marketing activities. This can be the deciding factor when European companies are selecting a service provider. Speak clearly about your choice of development platform(s). Which one(s) you work with and why.

Read our study about outsourcing software development services to find out more about the market for software development in general.

See our study about demand for IT outsourcing services in the European market for more information about what makes Europe an interesting market for IT outsourcing in general.

Many European start-up companies focus on IoT and IIoT solutions. Look for such companies to partner with.

3. Which European countries offer most opportunities for IoT services outsourcing?

There are two European countries among the top five countries worldwide that have seen the highest IoT revenue. These are Germany and the UK. The Nordic countries and the Netherlands are interesting markets because of their growth in IoT adoption, but also due to their openness to outsourcing. The UK remains interesting both despite and because of Brexit. Central and Eastern European countries show significant growth in IoT adoption, making them interesting markets too.

Germany: Europe's IoT champion

Revenue in the German IoT market is projected to reach €1.31 billion* in 2022. That makes it the third largest IoT revenue market in the world, behind the United States of America (€4.31 billion*) and China (€4.13 billion*), (*converted from USD). The majority of Germany's IoT spending is in enterprise and industrial IoT, with the automotive and manufacturing sectors leading the country's IoT adoption rate. The IoT solution market in Germany is strongly driven by mid-market companies.

Germany has a strong interest and history in industrial IoT, having made constant industrial investments and innovations in the past decades. It is therefore no surprise that Germany is a pioneer in utilising 5G to further increase the use of industrial IoT. In December 2021, German carrier Deutsche Telekom said over 87% of the German households can access its 5G network.

Initially, German companies saw IoT as a mechanism to develop new services and business opportunities, but the perception is changing more recently to increasing the use of IoT to generate higher efficiency in existing processes leading to cost reductions. Despite Germany's large IoT market size, cybersecurity is gaining importance too. When offering IoT solutions, it is recommended to focus on minimising vulnerabilities by, for instance, combining IoT solutions with blockchain and edge processing technologies.

Germany is a very interesting market due to its large market size, but Germany remains risk sensitive and less open to offshore outsourcing compared to other European countries, such as the United Kingdom and the

Netherlands. This is changing as German companies face skill shortages and become more experienced in offshore outsourcing. The COVID-pandemic has also created more opportunities for outsourcing companies, as the pandemic has been a crucial moment in showing what is possible with remote working and outsourcing. The COVID crisis has softened Germany's generally stiff corporate culture.

German companies naturally prefer to work and collaborate in German, which is why they prefer nearshoring when they do outsource. You can increase your chances of success in Germany by collaborating with a local German-speaking partner rather than approaching end users directly. Increase your chances of success in Germany by focusing on mid-market companies in the industrial sectors, which drive IoT adoption.

Tip:

- Note that many websites in Germany are available only in German, because Germans prefer to do business in their own language. If you would like to research potential German customers, make sure to install a translation extension on your browser or to use a translation tool.

The United Kingdom (UK): second largest IoT market in Europe

Revenue in the IoT market in the United Kingdom is projected to reach €1.0 billion* in 2022. That makes it the fifth largest IoT revenue market in the world, behind the United States of America (€4.31 billion *), China (€4.13 billion *), Germany (€1.31 billion *) and Japan (€1.13 billion *), (*converted from USD).

Brexit resulted in a large number of people with a working visa leaving the United Kingdom. This left the United Kingdom with a shortage of skilled people in various industries, including the IoT field. This makes the United Kingdom an extra interesting market for IoT services outsourcing.

Research by Technavio showed that the IoT market in the UK is expected to grow by a CAGR of 11.8% between 2021 and 2026. During this forecasted period the Radio Frequency Identification (RFID) segment is expected to have significant market share growth. Mainly because of the increasing demand from the retail and healthcare industry.

Of all reviewed companies in the United Kingdom, 18% say their main goal of IoT deployment is cost reduction. Improving business processes is also a very important driver for companies from the United Kingdom that want to start using IoT, and 18% of the companies say that is their main goal. The number of smart devices in homes in the United Kingdom has grown exponentially and the market is expected to be worth €6.44 by 2024, with a household penetration of almost 45% at this point.

Of all European countries, the United Kingdom is the most open to offshore outsourcing and the least cautious about doing business with companies in developing countries. Their openness is influenced by their cost-savings business culture and their long-standing business relations with many countries.

France: a large market where language matters

The French IoT market is large and growing quickly. In 2020, the market had a value of €2,678 million – almost a 60% increase from 2019, when the market value was estimated at €1,680 million.

The French IoT market is driven by the booming IT and Telecommunication industry in the country. Besides this, the increasing adoption of big data analytics and cloud computing solutions is expected to fuel the market even more. France also sees an increase in smartphone users and an increase in investments and new product launches related to IoT.

The hardware sector is expected to remain dominant for the next few years. In the vertical industries, consumer electronics is expected to dominate the market. Major players in the French (I)IoT market are Intel Corporation, Compagnie IBM France, Amazon Webservices France, Robert Bosch France SAS, Cisco Systems, SAP France SA, Microsoft France, Oracle France, SAS, General Electric Company and Hewlett Packard France SAS.

Although France has a large IoT market size, the French prefer to collaborate and work in their own language. Speaking French or finding a partner able to do so will increase your chances of success when entering the French market.

Tips:

- Look up the IoTone website to learn about IoT suppliers in various countries, including France. Look also into case studies to see what IoT solutions these companies have introduced.
- Note that many websites in France are available only in French, because they prefer to do business in their own language. If you would like to research potential French customers, make sure to install a translation extension on your browser or to use a translation tool.

The Nordics: most open to outsourcing

The Nordic markets are very much open to outsourcing. Although the combined markets of Sweden, Finland, Denmark, Norway and Iceland are smaller than the markets of Germany, the United Kingdom, France and Italy, their combined spending almost reached €13 billion in 2019. And their growth was expected to reach €17 billion in 2021 (the actual numbers of 2021 were not yet available when we published this study).

The Nordic growth in IoT spending is fuelled by the increasing adoption of IoT solutions by enterprises. There are three factors that will enhance the market growth in the upcoming years: the need for effective monitoring of business processes, the need for improvement in business values and the need for a significant increase in efficiency. In 2021, companies in the Nordic countries were the most frequent users of IoT devices.

Due to their openness to outsourcing, these growing markets could be interesting for you. Experts believe that the competition in Nordic markets will be less strong than in the United Kingdom, making them easier targets to consider.

The Netherlands: late starter, ready for a sprint

The Netherlands has not been an early adaptor of IoT solutions. For example, in 2021 the European average of IoT usage in enterprises stood at 29%, the Netherlands performed below average at 21%. However, this is changing, the number of connected IoT devices is growing and the advantages and importance are increasingly recognised by Dutch companies.

The Netherlands is more on the forefront when it comes to consumer IoT use. The Netherlands ranks third in the list of countries with the most consumer IoT appliances in Europe.

The 5G network was launched in April 2020, with a key focus on Amsterdam, Eindhoven, Groningen and Rotterdam areas. However, in December 2021, only 6% of Dutch people were actually using 5G. The Netherlands is also the first country to have nationwide LoRa network coverage. A LoRa network (Lower Power Wide Area) is particularly interesting for IoT applications, as it is good for the battery life of the connected devices.

Because of increasing use in innovative technology, the Netherlands is gaining the position of ‘guiding country’

when it comes to IoT initiatives. Other countries that have been marked ‘guiding IoT countries’ are Germany, Sweden and the United Kingdom.

Companies in the Netherlands are traditionally fairly open towards outsourcing. Language barriers for doing business in the Netherlands are generally low, as the Dutch are very proficient in English.

Romania: competition and opportunities

Romania was previously mostly seen as a competitive destination. However, they are faced with a talent shortage and they are increasingly looking for companies to partner with. This could be your company.

Romania is following the European trend, where COVID-19 accelerated the adoption of digital solutions in most sectors. In 2021, a little more than 10% of Romanian enterprises was using IoT devices. That is relatively low compared to the European average of 29%, but with a high growth percentage and increasing interest in IoT solutions, there is a lot of work to be done

Tips:

- Look up the large-scale IoT pilots across Europe.
- Determine which country is best to target by looking at what cultural similarities you have with it, what diaspora there is, what historical ties you may have with it and what languages are spoken there. These factors will influence which countries are more suitable than others.
- Identify which countries have the greatest demand for your particular expertise by seeing which specific IoT events are taking place in different countries.
- Online IoT initiatives can help you find customers. Several European countries have launched or are launching national initiatives to stimulate industrial IoT implementation. These include PlattformIndustrie 4.0 in Germany and Smart Industry in the Netherlands, which can have a positive effect on the industrial markets. They often invite companies to participate, for example, via working groups with stakeholders.
- Check the European Commission’s Futurium page, the ‘groups’ page is particularly interesting. Also keep track of other new initiatives that can boost national markets for IIoT services.
- Take a look at our study about trends in the European IT outsourcing market to see which trends are impacting IT outsourcing in Europe in general.

4. What trends offer opportunities for IoT services outsourcing?

The technology behind IoT is advancing rapidly, becoming faster, cheaper, and more efficient. Other trends are the opportunities that can be found in the metaverse and other niches like robotics.

Digital transformation is accelerated

COVID-19 has accelerated the digital transformation (the change of businesses in the digital age). The mass adoption of working from home, online shopping, food deliveries and virtual events has only increased the demand for IoT solutions in Europe. The digital transformation is also very present in the Healthcare industry.

IoT is one of the key technologies enabling and driving the digital transformation. The ability of devices to sense and transmit data brings companies considerable benefits, but would be impossible for humans to handle.

The digital transformation is supported by an increasing connectivity

performance

5G, the next generation of mobile data infrastructure, will with its higher bandwidth enable the rise in the number of devices connected to the internet. As well as the amount of data they generate. The new 5G technology that will be rolled out in the coming years will allow more than 350,000 devices to be connected per square kilometre, which is 500 times more than comparable existing technologies. Although 5G may not provide any direct opportunities by itself, it is necessary for the expansion of IoT.

The European Union intends to have 5G cover at least 40% of the European workforce by 2025, including 70% of European industrial sites and 80% of main logistics routes. Because it will enable more devices to connect to the internet, 5G is considered one of the most important infrastructures to further develop IoT.

Edge computing

The arrival of 5G connections also paved the way for Edge computing. The reduction in cost and the increased computing power of the devices used in the IoT make it possible to process data collected on the edge (on the device itself, before sending over the data) and allow huge bandwidth savings. It also leads to greater compliance with privacy regulations, in many cases. This is because the data is collected and encrypted on the device itself, instead of sending out raw data.

Tip:

- Read more about the current status of the availability in different European countries and regions on the website of the European 5G Observation.

The value of IoT solutions is increasingly recognised

The perceived value proposition of IoT is increasing. Research shows that end users worldwide increasingly believe that the value provided by IoT is worth the investment. In addition to that, European end users are noticing more value achieved as well. This means the value or Return on Investment (ROI) provided by IoT solutions increasingly meets or exceeds expectations. This all contributes to a better image of IoT solutions and therefore enhances the demand.

Tip:

- Emphasise the benefits of IoT solutions. On your website also include success stories about how your IoT solution solved a customer's problem, or how it benefit their business. Do be careful with the information you provide, make sure that anything you share can indeed be shared in line with privacy and non-disclosure agreements you might have with your customers.

Lower-cost higher-performance hardware is available

Hardware necessary for good IoT solutions and services has become significantly cheaper over the past ten years. And at the same time, the available hardware is able to perform better. This lowers the threshold for the adoption of IoT solutions and services.

However, the current global chip shortage has already led to a negative impact on the delivery of new IoT products. This shortage is not very likely to be resolved quickly. Experts predict the shortage will last well into 2022 and quite likely also in 2023. The chip shortage is also negatively impacted by the war in

Ukraine.

For example, every connected IoT device that makes use of a cellular connection (4G, 5G, LTE-M, NB-IoT) uses a cellular IoT chipset. This chipset can be embedded directly into the device's printed circuit board or into an IoT module that is placed in the device.

Improvements in analytics, machine learning, artificial intelligence and their combinations

Over the last ten years, the progress in hardware is matched by significant developments in analytics, AI and ML. This enables significantly faster and more detailed insights and thus an increasing availability and accuracy in decision-making from the data that is provided by IoT solutions.

Combining technlogies

These developments increase the opportunities to find niches that combine these different technologies. Examples of SMEs from developing countries that have successfully tapped into the opportunity to combine IoT with ML and AI are Vadion from Pakistan, which developed an IoT app for the start-up Quiske from Finland that evaluates a rower's performance and helps improve it and Gurzu from Nepal, which creates all sorts of innovative software solutions for international customers.

At the moment, the technology is more than sufficient to support the best IoT solutions. This provides many opportunities for companies that are developing their own IoT services.

Opportunities in robotics

Robotics in artificial intelligence involves designing, developing and producing devices, machines and robots that can replace humans and replicate human actions. The global robotics technology market was valued at €50.4 billion* in 2020 and is expected to reach €150.7 billion* in 2028 (*converted from USD). This is a CAGR of almost 13%.

Robotics and IoT are considered two separate fields, but their technologies are intertwined and grow simultaneously. It is expected that the Internet of Robotic Things (IoRT) will be a growing value-added niche combining the two. IoRT involves the combination of sensor data from a range of sources, processes and using it to control and manipulate objects in the physical world. IoT sensors and data analytics technologies give robots an even wider situational awareness leading to better task execution.

Opportunities in the metaverse

When Facebook announced it was going to change its name in Meta in October 2021, most people were shocked. Mark Zuckerberg said the company would bet its future on the concept of the metaverse, a word that was new to many people. Of course other companies had also already invested into the same (or a similar) concept. For example Microsoft (Microsoft Mesh) and Nvidia (Omniverse).

The metaverse can be described as a graphically rich virtual space (with some degree of 'reality'), where people can work, play, shop, socialise, etc. (i.e. do things humans like to do together in real life). People that want to promote the metaverse often focus on the aspect of 'presence' as a defining factor. The idea is that users get the feeling they are really there and feel like other people are really there with them.

There is also the industrial metaverse, which refers to a mixed reality and augmented reality scenarios in enterprises and, more specifically, in product development and manufacturing.

Industry experts are still debating to what extent the metaverse will offer good opportunities and how to seize them. The most obvious segment is the use of 'digital twins', this means learning AI-based software

representations of a physical asset or system. But right now, the opportunities seem plentiful.

Tips:

- Read more about IoRT , how it is connected to IoT and additional niches that could offer opportunities for specialisation.
- Read more about the opportunities for IoT services in the metaverse, for example in this article about the two dimensions where the metaverse will impact IoT, or this blog about the five key technologies for the development of the metaverse.

This study was carried out on behalf of CBI by Globally Cool B.V. in collaboration with Laszlo Klucs.