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HANNOVER MESSE

Empresa XXI

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THE TRADE SHOW | ENERGIZING INDUSTRY

SUPER ROBOTS AND ENERGY 4.0

HANNOVER MESSE WILL BRING TOGETHER SOME 3,000 EXHIBITORS APRIL 22-26 TO SHOW HOW TO ACHIEVE CLIMATE NEUTRALITY THROUGH ELECTRIFICATION, DIGITALIZATION AND AUTOMATION

Hannover Messe is finalizing the details for the celebration of its next edition between April 22 and 26. As every year, Empresa XXI, with the special "Hi-Tech Basque Country", will accompany more than 30 Spanish companies in an industrial summit that will bring together relevant players from the mechanical engineering, electrical engineering, digital industry and energy sectors to showcase future trends in artificial intelligence and machine learning, carbon neutral production, Industry 4.0 and X-manufacturing, as well as hydrogen and fuel cells.

This year's international event, themed "Energizing a sustainable industry," will present an interconnected ecosystem whose companies will demonstrate how climate neutrality can be achieved through electrification, digitalization and automation.

More than 130,000 visitors expected at HM 2023

Robotics, a key topic

Around 3,000 exhibitors and some 300 start-ups will present innovative solutions for an efficient and sustainable industry in more than a dozen halls at the exhibition center.

Robotics will be an integral part of Hannover Messe, with robots of all sizes and shapes on display, from industrial robots and cobots to autonomous mobile robots.

The conference program will include various discussion scenarios focusing on Energy 4.0, industrial transformation, 5G & industrial wireless, and the startup ecosystem. Experts will present the latest results of applied research, use cases from the fields of Industry 4.0 and AI, and the importance of efficient energy management and green hydrogen to achieve the common goal of CO2-neutral production. In short, the challenges facing the industry in times of energy scarcity and supply chain issues on an international level.

HANNOVER MESSE WILL FEATURE AN EXHIBITION OF ROBOTS AND COBOTS

NORWAY, A LEADING COUNTRY FOR GREEN TRANSITION

The event will include a program of supporting activities and technical sessions. On the one hand, the Research and Innovation Summit on April 22, where representatives from business and science as well as politics and civil society will discuss innovation in Europe: catalysts, competencies and cooperation, and artificial intelligence as a benchmark.

First Femworx Congress

And for the first time, on April 25 and 26, a professional congress for women, continuing the tradition of the WomenPower series, but with a new name: "Femworx, career advancement for women in industry".

In addition, several awards will be presented, including the Industrial Hermes Award, the Hermes Startup Award and the Woman Engineer Award to a female expert in the steam sector. Finally, Norway will be the country highlighted for its efforts in developing new solutions for the green industrial transition.

INDUSTRY MEGATRENDS

The conference program will touch four specialized stages. The Energy 4.0 seminar will cover topics such as energy security, climate neutrality, digitalization and sustainability. It will also touch on smart energy for Industry 4.0, AI in energy technology, circular economy and resource efficiency.

The Industrial Transformation Conference will serve as a platform for the exchange of ideas and experiences between technologies and industries, focusing on industrial megatrends, where experts from various disciplines will present use cases, knowledge and solutions.

Autonomy with 5G & Industrial Wireless

5G & Industrial Wireless will present long-term, sustainable communication solutions for a pervasive connectivity and industrial wireless ecosystem. An area of critical importance to make production facilities and intralogistics even more flexible, autonomous and efficient.

Finally, the Industrial Startups Conference Stage will bring together the ecosystem of entrepreneurs and their revolutionary solutions and business models for industry.

EUROPEAN UNION | DIGITIZATION

EUROPE LEAVES A LOW-INTENSITY FOOTPRINT

DIGITALIZATION, ONE OF THE PILLARS OF "EUROPEAN SOVEREIGNTY", IS 80% DEPENDENT ON IMPORTED PRODUCTS

EUROPE SHOWS AN UNEVEN BALANCE IN 2023

The use of digital technologies reflects deficits in artificial intelligence and e-commerce sales in European industries with 10 or more employees.

	NO CLOUD SERV.	AI	%EMPL. INTERNET	E-COMM SALES
EU-27	**56.4%**	**5.5%**	**53.8%**	**10.4%**
Belgium	50.3%	11.0%	65.8%	16.3%
Bulgaria	84.5%	2.2%	26.5%	6.1%
Czech Republic	52.9%	4.6%	48.3%	13.4%
Denmark	34.0%	9.7%	72.5%	12.2%
Germany	59.8%	7.5%	57.3%	9.0%
Estonia	43.1%	3.4%	47.4%	10.8%
Ireland	30.1%	6.7%	64.1%	14.9%
Greece	68.5%	4.8%	45.4%	12.2%
Spain	**73.6%**	**7.3%**	**50.7%**	**19.8%**
Basque Country	**73.6%**	**6.5%**	**53.5%**	**17.8%**
Navarra	80.9%	7.3%	48.1%	20.1%
Madrid	71.4%	6.2%	57.7%	21.5%
Cataluña	59.9%	10.6%	55.5%	20.5%
France	76.4%	3.4%	61.3%	7.0%
Croatia	56.0%	5.3%	45.2%	17.6%
Italy	38.0%	4.4%	52.5%	7.9%
Cyprus	51.4%	2.6%	39.7%	8.3%
Latvia	68.9%	3.1%	49.6%	9.0%
Lithuania	62.1%	3.8%	51.5%	28.8%
Luxembourg	71.2%	11.5%	53.2%	3.2%
Hungary	54.4%	3.3%	50.0%	13.1%
Malta	34.0%	10.3%	50.9%	14.9%
Netherlands	42.7%	9.1%	73.8%	16.5%
Austria	56.6%	8.5%	60.7%	11.2%
Ostösterreich	57.7%	7.8%	61.6%	9.6%
Poland	43.9%	2.4%	43.4%	8.5%
Portugal	64.8%	6.7%	37.5%	4.9%
Romania	84.5%	0.8%	29.3%	5.4%
Slovenia	62.5%	9.0%	51.6%	7.5%
Finland	16.6%	10.0%	79.4%	12.0%
Sweden	24.5%	5.1%	84.8%	14.9%

Percentage of industrial companies with 10 or more employees. 2023. Source: Eurostat.

The digital transition is one of the mazes to be overcome in order to maintain the competitiveness of the European Union. For companies in the old continent, this challenge is more difficult and demanding than for the rest of the world. Companies' investments have to meet this digitalization objective, while at the same time meeting higher environmental standards than their international competitors. This combination of accelerated transitions affects all business segments, but especially small and medium-sized companies. The lack of size and cash flow, if any, puts a greater strain on the implementation of the strategies designed.

This situation is recognized by the European Union itself in its plan for "A Sovereign and Competitive Europe". As a starting point, it stresses that the position of European companies is not good. It explains this qualification by pointing out that the revenues of European companies in ICT markets will fall from 21.8 percent of the world in 2013 to 11.3 percent in 2022, while American companies will rise from 26.8 percent to 36 percent. In addition, it estimates the EU's dependence on foreign countries for digital products, services or infrastructure at 80%, not forgetting that Asia is taking over the semiconductor market.

EUROPE LOSES WEIGHT IN THE GLOBAL IT MARKET BETWEEN 2013 AND 2022

Cybersecurity laboratory of the Basque technology center Tecnalia.

Plan and objectives for 2030

This scenario has triggered the development of a European plan until 2030 to facilitate and secure leadership in four areas described as strategic: digital skills, digital infrastructure, digitization of the economy (including the use of AI) and digitization of public services.

THE LOW USE OF 'IA' AND HIGH CONNECTIVITY IS A CAUSE FOR CONCERN

The measures aim to reduce the deficits in these areas. In the case of business digitization, the starting point is reflected in the EU's first "Digital Decade" report, to be published in 2023. Three worrying data: weak deployment of 5G networks and gigabit connectivity, especially outside major cities (it is estimated an investment of 200 billion euros to achieve full coverage); very low projection in the use of artificial intelligence by companies; and the need to increase the number of "unicorns" (companies valued at more than 1,000 million euros), of which Europe will have 249 in 2023, compared to the 1,444 in the United States and 330 in China.

SMEs and figures

The Commission aims for more than 90% of SMEs to reach a basic level of digital intensity


TECNALIA

by 2030 (this index measures the use of 12 different technologies, such as AI, e-sales, etc.) and for 75% to use cloud computing services, perform big data analysis or use AI.

As we have pointed out, the difficulties for SMEs are proportionally much greater. The data shows that the reality varies by company size. For example, the report shows that 70% of companies - with a target of 90% - have reached a basic level of digital intensity (4 of the twelve parameters): 68% in SMEs and 98% in large companies. In the latter, 30% already have a very high digital intensity (10 to 12 parameters) and 54% a high digital intensity (more than 7 parameters). Among SMEs, 38% were in the low group (less than 6 parameters) and 31% in the very low group (less than 3 technologies).

Results by country

As can be seen in the attached table, the differences between countries are striking. In the case of very high intensity, the range is from 1% in Bulgaria to 12.6% in Finland, which leads the ranking, followed by Belgium (8.6%), the Netherlands (7.8%) and Sweden (+7.5%).

In the case of AI, Luxembourg, Belgium and Finland set the pace. In Germany, 7.5% of industrial companies used this tool in this area, compared to an average of 7.3% in Spain.

PROGRESS IN DIGITAL INTENSITY IN 2023

Eurostat data show progress in the percentage of industries with a very high index in the last two years, although their number is small.

	2023	2021		2023	2021
EU	**3.5%**	**2.5%**	Latvia	2.8%	0.9%
Belgium	8.6%	2.8%	Lithuania	2.1%	1.8%
Bulgaria	0.9%	-	Luxembourg	5.6%	4.8%
Czech Republic	3.0%	3.0%	Hungary	2.4%	1.1%
Denmark	4.2%	9.2%	Malta	-	2.2%
Germany	4.1%	3.2%	Netherlands	7.8%	2.1%
Estonia	2.4%	1.5%	Austria	5.7%	5.5%
Ireland	5.0%	3.9%	Poland	2.4%	1.5%
Greece	1.5%	2.7%	Portugal	2.3%	1.1%
Spain	**4.4%**	**2.6%**	Romania	0.6%	0.3%
Basque Country	**4.4%**	**-**	Slovenia	3.9%	3.6%
France	-	0.5%	Slovakia	1.8%	1.1%
Croatia	3.6%	1.8%	Finland	12.6%	11.5%
Italy	2.5%	2.3%	Sweden	7.5%	10.0%
Cyprus	1.8%	0.5%			

Manufacturing enterprises with ten or more employees. Percentage of enterprises with a very high intensity index (DII level 3). Source: Eurostat.

MACROECONOMICS | FOREIGN TRADE

THE EU DEFENDS ITS EXTERNAL COMPETITIVENESS

THE DATA ON EU EXPORTS TO THE REST OF THE WORLD MAINTAIN A GOOD VOLUME IN THE PRESENT CENTURY, ALTHOUGH THE GROWTH OF OTHER COUNTRIES ERODES THE INTERNATIONAL QUOTA

The export of goods, as a thermometer of the competitiveness of the European economy, has been affected in its evolution by the financial crisis and the "covid" crisis, as well as by the protectionist movement registered in recent years. The statistics of the World Bank illustrate the situation. In 2022, the foreign sales of the EU countries amounted to 7.152 trillion euros, with an annual increase of 8%. World exports, at 24.925 trillion, grew by 11%.

This benchmark indicates a delay in the recovery, which is accentuated if the benchmark is taken with EU exports outside the Union and intra-EU exports. The former, at 2.703 trillion euros, recovered by only 5% in 2022 compared to 2021, while the latter, at 4.448 trillion euros, increased by 9%. In other words, the EU's internal market offers a space that companies use to compensate for the greater difficulty of access to other countries.

THE BASQUE COUNTRY, UNLIKE GERMANY AND SPAIN, IS GROWING FASTER IN THE EU THAN IN THE REST OF THE WORLD

To assess the deterioration of external markets, it is enough to say that between 2000 and 2022, EU exports outside the Community grew by 315% (in dollars, World Bank) and world exports by 386%. However, these differences will increase from 2008 (29 versus 54%) and 2019 (13 versus 31%).

China and North America win

In quantitative terms, EU exports to the rest of the world in 2022, at 2.703 trillion, will be overtaken by China ($3.593 trillion) and North America ($3.241 trillion). The United States will lag behind with $2.064 trillion.

Germany will remain Europe's leading exporter. In 2022, 40% of its exports were shipped outside the EU, which amounted to about $663 billion. Spain, with a 37% share of exports outside the EU, had a volume of nearly $155 billion in 2022, while the Basque Country, with a 44% share, had a balance of $14.317 billion.

Based on data from the German Federal Statistical Office, INE and Eustat, which have already brought forward the data for 2023, a slight increase in the share of exports outside the Union can be seen in the present century.

Evolution 2000-2023

In Germany, they represented about 35% of foreign sales in the first decade, to accelerate the pace after the financial crisis of 2008. The percentage peaked in 2013 at 43 percentage points, before stabilizing in the following years and settling in the 40% range (41% in 2023).

In the case of Spain, the progress is constant, from 34% in 2003 to 44% in 2013, the year in which it exceeded 100 billion euros for the first time. In the following years, there will be a slight decline that will bring the percentage to 37% in 2022 and 2023.

For its part, the extra-EU exports of Basque companies began the century

EXTRA-EU EXPORTS HAVE SLOWED DOWN IN RECENT YEARS

Data from Germany, Spain and the Basque Country show that the export drive outside the EU is slowing down after the expansion in the second decade of the 2008 financial crisis, which affected consumption in the EU's domestic market.

	GERMANY			SPAIN			BASQUE COUNTRY		
	WORLD	%EU/WLD	%REST/WLD	WORLD	%EU/WLD	%REST/WLD	WORLD	%EU/WLD	%REST/WLD
2023	1,562	59%	41%	355	63%	37%	33	62%	38%
2022	1,594	60%	40%	389	63%	37%	33	56%	44%
2021	1,379	59%	41%	315	61%	39%	26	56%	44%
2020	1,207	58%	42%	264	61%	39%	21	55%	45%
2019	1,328	59%	41%	291	59%	41%	25	52%	48%
2018	1,317	59%	41%	285	59%	41%	26	52%	48%
2017	1,279	59%	41%	276	59%	41%	24	52%	48%
2016	1,204	59%	41%	256	59%	41%	22	52%	48%
2015	1,194	58%	42%	250	57%	43%	22	51%	49%
2014	1,124	58%	42%	241	57%	43%	23	50%	50%
2013	1,088	57%	43%	236	56%	44%	21	50%	50%
2012	1,093	57%	43%	226	57%	43%	21	50%	50%
2011	1,061	59%	41%	215	60%	40%	20	52%	48%
2010	952	60%	40%	187	62%	38%	18	51%	49%
2009	803	63%	37%	160	63%	37%	15	50%	50%
2008	984	64%	36%	189	62%	38%	20	55%	45%
2007	965	65%	35%	185	63%	37%	19	55%	45%
2006	893	64%	36%	170	63%	37%	17	57%	43%
2005	786	65%	35%	155	64%	36%	14	58%	42%
2004	732	65%	35%	147	65%	35%	14	57%	43%
2003	664	65%	35%	138	66%	34%	12	60%	40%
2002	651	64%	36%	133	65%	35%	12	59%	41%
2001	638	64%	36%	130	66%	34%	12	59%	41%
2000	597	65%	35%	124	65%	35%	12	58%	42

Data in billions of euros. 2023, provisional. Source: Federal Statistical Office of Germany, INE (Spanish National Statistics Institute) and Eustat (Basque Statistics Institute). Elaboración: Empresa XXI.

at a level above 40 percent (about seven points above Germany and Spain) to reach 50 percent for several years, the last in 2014. Then there was a decline that was accentuated to fall to 38% in 2023.

For their part, extra-EU exports of Basque companies began the century at a level above 40 percent (about seven points above Germany and Spain) to reach 50 percent several years, the last in 2014. Then there was a decline that was accentuated to fall to 38% in 2023.

It is very likely that this trend was influenced by a greater commitment to more stable markets such as Europe and difficulties with clients in North Africa and Latin America. Not to mention the use of tariffs in some countries, which was less intense in the EU.

IN FACT, BASQUE COUNTRY EXPORTED HALF OF ITS SALES OUTSIDE THE EU

With regard to the risk for the EU, it should be noted that the World Bank shows dangerous differences in growth rates between the world and the EU and the rest of the world by product segment. For example, between 2019 and 2022, sales in the automotive industry grew by 4% in the world and by 2% in Europe. In telecommunications equipment, the difference was greater: 70 to 9%, which was partially offset in electronic printed circuits, with 10 to 45%.

ASIA GAINS 9 POINTS OF WORLD EXPORT SHARE

The countries with the highest percentage growth in extra-EU sales between 2000 and 2022 are China (+1,442%), Poland (+1,136%) and India (+1,070%).

	2022		2019		2008		2000	
	VALUE	%WORLD	VALUE	%WORLD	VALUE	%WORLD	VALUE	%WORLD
Asia	9,119	37%	6,773	36%	4,725	29%	1,835	28%
Europe	8,701	35%	6,980	37%	6,562	41%	2,647	41%
EU - Mundo	7,153	29%	5,825	31%	5,496	34%	2,172	34%
EU - a la UE	4,449	18%	3,439	18%	3,402	21%	1,314	20%
China	3,594	14%	2,499	13%	1,431	9%	249	4%
North America	3,242	13%	2,553	13%	2,035	13%	1,225	19%
EU - extra UE	2,704	11%	2,386	13%	2,093	13%	858	13%
USA	2,064	8%	1,643	9%	1,287	8%	782	12%
Germany	1,658	7%	1,489	8%	1,446	9%	552	9%
Netherlands	967	4%	709	4%	638	4%	233	4%
Japan	747	3%	706	4%	781	5%	479	7%
South Korea	684	3%	542	3%	422	3%	172	3%
Africa	665	3%	482	3%	563	3%	147	2%
Italy	657	3%	538	3%	543	3%	241	4%
France	618	2%	571	3%	616	4%	328	5%
Russian Federation	588	2%	420	2%	472	3%	105	2%
United Kingdom	530	2%	460	2%	477	3%	283	4%
Singapore	516	2%	391	2%	338	2%	138	2%
Australia and New Zealand	458	2%	311	2%	218	1%	77	1%
India	453	2%	324	2%	195	1%	42	1%
Spain	418	2%	334	2%	281	2%	115	2%
Saudi Arabia	411	2%	262	1%	313	2%	78	1%
Switzerland	402	2%	314	2%	201	1%	81	1%
Poland	361	1%	267	1%	170	1%	32	0%
Brazil	334	1%	221	1%	196	1%	55	1%
WORLD	**24,926**	**100%**	**19,017**	**100%**	**16,169**	**100%**	**6,454**	**100%**

Data in billions of USA dollars. Source WTO Stats.

SERVICES HELP EXPORTS

The World Bank's data on exports of goods and services gives a better balance for the European Union in 2022 than for goods alone. In that year, the institution estimates a value of $30.682 trillion for the world as a whole, with an annual increase of 10%.
For the European Union, the value was set at 9.846 trillion euros and an annual increase of 8 percent.
The United States grew by 17% year-on-year to 2.969 trillion euros.
Among the major EU countries, Spain, driven by construction and engineering companies, recorded an annual increase of 16 percent to €579,518 million.
France had a turnover of $1.005 trillion (+9%) and Italy $745,372 million (+8%). Germany, meanwhile, added 2.052 trillion dollars, up 3 percent.

MACROECONOMICS | WORLD

EUROPE, TWO-SPEED GDP GROWTH

ECONOMIC GROWTH IN THE EU IS STRONGER IN THE EAST THAN IN THE WEST, WHILE THE AGGREGATE IS MOVING AWAY FROM THE MAIN REGIONS

EUROPEAN GDP RECOVERS SLIGHTLY

The 2022 data and the 2023 advance confirm a weaker recovery in the West and a deeper recovery in the East and the islands.

	2023	2022	%22/21	%22/14
EU - 27 (from 2020)	-	15,905	+9%	35%
Euro area – 20 (from 2023)	-	13,492	+8%	32%
Euro area - 19 (2015-2022)	-	13,424	+8%	32%
Euro area - 12(2001-2006)	-	13,070	+8%	31%
Germany	4,121	3,877	+7%	32%
France	-	2,639	+5%	23%
Italy	-	1,946	+7%	20%
Spain	**1,462**	**1,346**	**+10%**	**30%**
Netherlands	1,033	959	+10%	43%
Poland	-	655	+14%	61%
Sweden	-	563	+4%	28%
Belgium	-	554	+9%	37%
Ireland	-	506	+17%	159%
Austria	-	447,	+10%	34%
Denmark	375	381	+11%	43%
Romania	-	284	+18%	89%
Czech Republic	-	276	+16%	75%
Finland	-	268	+7%	30%
Portugal	-	242,	+12%	40%
Greece	-	207	+14%	17%
Hungary	-	169	+10%	59%
Slovakia	-	110	+9%	44%
Bulgaria	-	86	+21%	99%
Luxembourg	-	78	+7%	50%
Croatia	-	68	+16%	54%
Lithuania	-	67	+19%	84%
Slovenia	63	57	+9%	52%
Latvia	-	39	+17%	65%
Estonia	-	36	+16%	80%
Cyprus	-	278	+11%	59%
Malta	-	17	+14%	99%

Data in billions of euros. Source: Eurostat (february 2024).

The first GDP data in Europe in 2023 (Eurostat, February 2024) mark increases in constant euros in Germany (+6.7%), Spain (+8.6%), the Netherlands (+7.8%) and Slovenia (+10.6%), and a slight decline in Denmark (-1.6%). However, the quarterly growth of the German economy was provisionally reduced by 0.2% in the fourth quarter and by a further 0.3% in the third quarter, so that it technically entered into recession.

This situation reflects the different GDP cycles in different European countries. Those in the East tend to grow faster than those in the West. A difference that should be considered logical because of the starting point and the channelling of community resources and private investment for the development of their economic fabric.

For example, Eurostat data for the period 2014-2022 show GDP growth of 35% in the EU-27 and 31% in the Euro-12 area. This difference is accentuated when the magnifying glass is placed by country.

European countries

The largest EU economies grew over the period: 32% in Germany, 30% in Spain, 23% in France and 20% in Italy. In contrast, the islands took advantage of their tax advantages and multinational landings to grow by 159% in Ireland and 99% in Malta, while the depth of the increase was most notable in Bulgaria (+99%), Romania (+89%), Lithuania (+84%), Estonia (+80%) and the Czech Republic (+75%).

The statistics for the last available year (2022) do not show any significant changes in the cycle. Germany (+7%), France (+5%), Italy (+7%), Spain (+10%) and the Netherlands (+10%) move in a range far from the 17 to 21 percent of Bulgaria, the Czech Republic, Latvia, Lithuania and Romania.

25%

OF GLOBAL GROWTH BETWEEN 2000 AND 2022 COMES FROM CHINA

Comparison with the world

If we take the World Bank as a reference, in US dollars at current prices (which adds the exchange rate effect), we see that the countries of Eastern Europe, without occupying leading positions in growth, are among the most dynamic. On the other hand, the Western countries occupy the last places, although surpassed by Japan, which remains the third largest economy with a GDP of 4.26 trillion dollars in 2022, 14% below the 2000 figure (4.97 trillion dollars).

The World Bank ranks Romania, Bulgaria, Ireland, the Czech Republic, Poland and Slovakia 11th to 38th in terms of growth in the current century of countries with a GDP of more than 75,000 trillion dollars in 2022.

For their part, the countries of the West grew below the world rate: 198% between 2000 and 2022. France (+104%), Germany (+110%) and Spain

EUROPE LAGS MOST SINCE 2008

The dollar measure of GDP for major countries shows the weakness of European growth relative to other areas, excluding Japan.

	2022	%22/21	%22/08	%22/00	2022%	2000%
USA	25.44	+9%	+72%	+148%	25%	30%
China	17.96	+1%	+291%	>999%	18%	4%
Japan	4.26	-15%	-17%	-14%	4%	15%
Germany	4.08	-5%	+9%	+109%	4%	6%
India	3.42	+9%	+185%	+631%	3%	1%
United Kingdom	3.09	-2%	+5%	+85%	3%	5%
France	2.78	-6%	-5%	+103%	3%	4%
Russian Federation	2.24	+22%	+35%	+763%	2%	1%
Canada	2.16	+7%	+39%	+190%	2%	2%
Italy	2.05	-5%	-15%	+78%	2%	3%
Brazil	1.92	+16%	+13%	+193%	2%	2%
Australia	1.69	+8%	+59%	+306%	2%	1%
South Korea	1.67	-8%	+59%	+190%	2%	2%
Mexico	1.47	+12%	+27%	+98%	1%	2%
Spain	**1.42**	**-2%**	**-13%**	**+137%**	**1%**	**2%**
Indonesia	1.32	+11%	+159%	+700%	1%	0%
Saudi Arabia	1.11	+27%	+114%	+498%	1%	1%
Netherlands	1.01	-2%	+6%	+142%	1%	1%
North America	27.61	+9%	+69%	+151%	27%	32%
European Union	**16.75**	**-3%**	**+3%**	**+130%**	**17%**	**21%**
TOTAL WORLD	**100.88**	**+4%**	**+57%**	**+198%**	**100%**	**100%**

Data in trillions of dollars. Countries with more than $1 trillion GDP in 2022.
Percentage share of each country and region in world GDP.
Source: World Bank. Prepared by Empresa XXI.

(+137%) will outperform the United Kingdom (+85%) and Italy (+79%). The United States recovered by 148%, the EU by 130% and the eurozone by 118%.

Europe in the world

To weight the above percentages, it should be noted that Romania (+707%) increased its GDP in dollars by 263,437 million, from 37,254 to 300,691; but Germany (+110%) did so by 2.13 billion.

Nor should it be forgotten that, in recent years, the increase in the price of oil and gas, especially in 2022, has contributed to the GDP of the producing countries. For its part, China (+16.751 trillion) contributed 25% to the global growth of 66.980 trillion dollars.

China's leap led it to account for 18% of world GDP in 2022, compared to 4% in 2000. This balance was not enough to catch up with the United States, which fell from 30% to 25%.

The EU, for its part, fell from 21 to 17 percent. Europe's largest countries also lost share: Germany by two points, from 6 to 4 percent, and France, Italy and Spain by one point.

THE WORLD'S FASTEST GROWING COUNTRIES IN THE 21ST CENTURY

Two Eastern European countries, Romania and Bulgaria, are among the top twenty. This ranking is dominated by oil-producing countries, Asian countries, and the surprising Ethiopia, led by Nobel Peace Prize winner Ebiy Ahmed.

	2022	%22/21	%22/00
Ethiopia	127	+14%	+1,438%
Azerbaijan	79	+44%	+1,393%
China	17,963	+1%	+1,383%
Qatar	236	+31%	+1,230%
Vietnam	409	+12%	+1,211%
Kazajstan	225	+14%	+1,133%
Angola	107	+61%	+1,070%
Kenya	113	+3%	+793%
Russian Fed.	2,240	+22%	+763%
Bangladesh	460	+11%	+762%
Romania	301	+5%	+707%
Indonesia	1,319	+11%	+699%
India	3,417	+8%	+629%
Nigeria	473	+7%	+583%
Bulgaria	90	+8%	+582%
Ecuador	115	+8%	+528%
Panama	767	+14%	+522%
Oman	115	+30%	+488%
Saudi Arabia	1,109	+27%	+485%
Uzbekistan	80	+16%	+484%
Tanzania	76	+7%	+466%
Iraq	264	+27%	+446%
Ireland	533	+4%	+432%
Ucrania	1601	-20%	+396%
Guatemala	95	+10%	+393%
UAE	507	+22%	+386%

	2022	%22/21	%22/00
Singapur	467	+10%	+386%
Philippines	404	+3%	+383%
Egypt	477	+12%	+378%
New Zealand	248	-3%	+371%
Czech Republic	291	+3%	+370%
Peru	243	+8%	+369%
Dominican Rep.	114	+20%	+367%
Kuwait	175	+28%	+365%
Malasia	407	+9%	+334%
Australia	1,693	+9%	+307%
Poland	688	+1%	+300%
Slovakia	115	-3%	+295%
Thailand	495	-2%	+292%
Israel	525,	+7%	+286%
Luxembourg	82	-5%	+285%
Chile	301	-5%	+284%
Iran	413	+15%	+277%
Pakistan	375	+8%	+277%
Hungary	177	-3%	+276%
Argelia	195	+19%	+256%
Norway	593	+18%	+246%
Colombia	344	+8%	+244%
Türkiye	907	+11%	+231%
Morocco	131	-8%	+204%
WORLD	**100,880**	**+4%**	**+198%**
Switzerland	818	+1%	+193%

	2022	%22/21	%22/00
Brazil	1,920	+16%	+193%
South Korea	1,674	-8%	+191%
Canada	2,161	+8%	+190%
South Africa	405	-4%	+167%
USA	25,440	+9%	+148%
Belgium	583	-3%	+146%
Denmark	400	-1%	+144%
Netherlands	1,009	-2%	+142%
Austria	471	-2%	+139%
Spain	**1,418**	**-2%**	**+137%**
European Union	16,747	-3%	+130%
Sweden	592	-8%	+125%
Finland	283	-5%	+124%
Argentina	631	+29%	+122%
Euro area	14,136	-4%	+118%
Portugal	255	-0%	+115%
Hong Kong	360	-2%	+110%
Germany	4,082	-5%	+110%
France	2,779	-6%	+104%
Mexico	1,466	+12%	+98%
United Kingdom	3,089	-2%	+85%
Puerto Rico	113	+7%	+84%
Italy	2,050	-5%	+79%
Greece	218	+1%	+67%
Japan	4,256	-15%	-14%

Data in trillions of dollars. Countries with more than 75,000 million GDP in 2022. Source: World Bank.

MACROECONOMICS | EUROPEAN REGIONS

DECADE OF CHANGE IN THE EU

THE GDP PER CAPITA OF EUROPEAN REGIONS IN THE PERIOD 2022-2011 LEAVES SIGNIFICANT DECLINES IN SPAIN, FRANCE AND GERMANY DUE TO THE GREATER IMPACT OF THE LAST THREE YEARS

PERCENTAGE OF GDP PER CAPITA IN RELATION TO THE EU AVERAGE

The regions of Germany and Spain show weakness in the evolution of their GDP per capita in the period 2019-2022, in the face of the push of other regions.

	2022	%22/19	2019	2011
Southern	286	+40%	205	115
Luxembourg	257	+2%	252	274
Eastern and Midland	247	+13%	218	165
Praha	207	+0%	206	186
Bruxelles-Capitale	196	-3%	202	217
Hamburg	195	-1%	196	204
Hovedstaden	191	+18%	162	158
Bucureti-Ilfov	177	+11%	160	129
Oberbayern	169	-5%	177	178
Noord-Holland	168	-1%	170	168
Ile de France	163	-10%	181	178
Warszawski stoteczny	162	+1%	160	141
Prov. Auton. di Bolzano	161	+4%	155	157
Stockholm	160	-3%	165	181
Utrecht (NUTS 2021)	159	+0%	159	168
Budapest	158	+4%	152	145
Prov. Brabant wallon	152	-4%	158	125
Salzburg	148	-1%	150	152
Vorarlberg	147	+10%	134	134
Darmstadt	146	-5%	153	167
Bratislavsky kraj	146	-10%	163	193
Stuttgart	145	-6%	154	160
Bremen	144	+2%	141	154
Prov. Antwerpen	142	+2%	139	139
Wien	142	-3%	147	165
Helsinki-Uusimaa	140	-2%	143	157
Prov. Vlaams-Brabant	136	+7%	127	126
Grad Zagreb	134	+8%	124	114
Sostins regionas	133	+8%	123	95
Groningen	132	+15%	115	156
Noord-Brabant	132	+3%	128	133
Braunschweig	131	-11%	148	142
Lombardia	130	+2%	127	140
Prov. Auton. di Trento	130	+3%	126	137
Valle d'Aosta	129	+4%	124	146
Tirol	129	-4%	134	133
Ovre Norrland	129	+11%	116	128
Mittelfranken	128	-6%	136	135
Zuid-Holland (NUTS 2021)	127	+3%	123	138
Oberosterreich	127	-2%	129	130
Karlsruhe	126	-5%	133	141
Tubingen	125	-5%	132	133
Oberpfalz	123	-3%	127	127
Berlin	122	-2%	124	121
Koln	121	-4%	126	130
Midtjylland	119	+3%	116	117
Düsseldorf	119	-3%	123	133
Rheinhessen-Pfalz	117	+6%	110	118
Madrid	117	-6%	124	126
Emilia-Romagna	117	+0%	117	126
Prov. West-Vlaanderen	116	+2%	114	113
Unterfranken	116	-4%	121	126
Limburg (NL)	116	+4%	112	113
Niederbayern	115	-2%	117	123
Vastsverige	115	+0%	115	123
Syddanmark	114	+1%	113	116
Aland	113	-2%	115	138
Prov. Oost-Vlaanderen	112	+5%	107	108
Schwaben	112	-6%	119	122
Steiermark	112	-3%	115	114
Zeeland	111	+10%	101	108
Freiburg	110	-5%	116	120
Hannover	110	-4%	115	121
Detmold	110	-4%	114	115
Lazio	110	-2%	112	131
Karnten	110	+2%	108	110
Oberfranken	109	-4%	114	113
Basque Country	**109**	**-7%**	**117**	**119**
Veneto	109	+0%	109	116
Overijssel	109	+2%	107	112
Zahodna Slovenija	109	+3%	106	101
Mellersta Norrland	109	+8%	101	116
Estanbul	109	+11%	98	93
Gelderland	108	+1%	107	115
Friuli-Venezia Giulia	106	+2%	104	112
Northern and Western	105	+31%	80	70
Liguria	105	+0%	105	113
Niederosterreich	105	+0%	105	105
Malta	104	+0%	104	84
Nordjylland	103	-2%	105	108
Kassel	103	-6%	109	112
Weser-Ems	103	-4%	107	108
Navarra	103	-6%	110	114
Alpes-Côte d'Azur	103	+5%	98	102
Toscana	103	-3%	106	111
Ostra Mellansverige	103	+2%	101	111

Several 2022 data are provisional and estimates. Source: Eurostat.

The evolution of regional GDP in the EU, with Eurostat statistics updated in February 2024, shows a weak evolution in recent years and estimable changes between regions in the last decade, 2011-2022.

This trend can be attributed to the health crisis, but other factors also seem to be affecting the economy. Rising energy prices in a dependent area and stricter EU legislation than in other parts of the world to accelerate the environmental and energy transition are weighing on profitability. Nor should we forget the impact of the "demographic winter" and the low employment rate in many regions, especially in the South. This deficit is also holding back the improvement in GDP.

As a first point of reference, the regions with the highest GDP in Europe have seen a marked decline in their per capita distribution in recent years. The big jumps in Ireland and capital cities such as Prague, Bucharest, Warsaw and Budapest, which together with Luxembourg top the table, have led to erosion in other parts of the continent.

THE BASQUE COUNTRY LOSES POINTS IN THE EUROPEAN AVERAGE OF GDP PER CAPITA

Losses in GDP per capita

Eurostat reflects this clearly. Between 2011 and 2022, Hamburg lost 9 points of EU average GDP per capita, from 204% to 195%; Oberbayern (169%) also lost 9 points; Ile de France (163%) lost 15 points; Stuttgart (145%) lost 15 points; Bremen (144%) lost 10 points; and Karlsruhe (126%) lost 15 points. Meanwhile, Berlin (122%) gained one point, although it lost two points in 2022 compared to 2019.

Spain also saw a general decline. Madrid (117%) ceded nine points, of which seven were recorded since 2019; the Basque Country (109%), 10 points, of which eight since 2019; Navarre (103%), 11 points; and Catalonia (99%), 9 points.

GDP growth

The result is a direct consequence of the attrition suffered by regional gross GDP between 2019 and 2022, in which there were notable differences between the major regions. Upper Bavaria, for example, will grow by 52.6% to 320.025 billion euros. Above Ille de Franca (+27%), Lombardy (+23%), Madrid (+32%) or Catalonia (28%).

The Basque Country, with a GDP of 79.35 billion euros, recovered by 24%. However, in 2022 compared to 2021, it increased by 9.9%, in line with Madrid and Catalonia, and well above the three large regions and the main areas of Germany, which increased between 3.3 and 6.9% in Upper Bavaria.

Another factor influencing the regional economy is the employment rate. In this area, the southern regions are clearly lagging behind. For example, 22 regions exceed the 80% rate, almost all of them in the north, with Oberbayern in the top group (80.6%). The leading Spanish regions

range from 67.8% to 69.5%. The Basque Country, in particular, reaches 68.4% and shows one of the most moderate increases between 2011 and 2022: 2.9 points, compared to increases of 6 points in Catalonia and 4.2 points in Madrid.

One aspect that is growing in the Basque Country in the last decade is employment related to technology and science, which includes employees with industrial training. With a jump of 10.5 points, to a percentage of 62.9% of the workforce, it has moved up to 16th place in Europe, ahead of Madrid (33rd place and 57.0%).

The Basque Country has also made significant progress in the percentage of researchers, rising from 1.17% to 1.56% between 2011 and 2022, placing it 27th in the ranking, also ahead of Madrid (51st with 1.22%).

In terms of high-tech employment, dominated by IT and pharmaceuticals, Madrid ranks 16th in the EU (9.0% of employment) and the Basque Country ranks 59th and second in Spain with 5.8%.

THE BASQUE COUNTRY GAINS POSITIONS IN RESEARCH AND TECHNOLOGY EMPLOYMENT

Finally, in terms of R&D expenditure as a percentage of GDP, data up to 2021, the Basque Country leads the ranking in Spain and ranks 51st in Europe with 2.32%.

In this case, the European leadership corresponds to Bravante Walloon (11.39%), accompanied by the German cities of Stuttgart (6.81%), Braunschweig (6.09%) and Tübingen (5.47%).

THE MAIN EUROPEAN REGIONS IN TERMS OF GROSS REGIONAL GDP

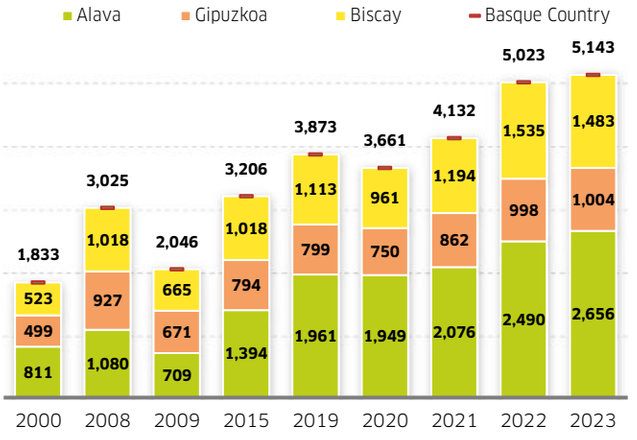
Regional data for 2022 show a limited acceleration in GDP recovery after overcoming the pre-cov the pre-cov period. The leader, the Paris region, even marks one of the lowest annual growth in 2022.

	2022	%22/21	%22/19	%22/11
Ile de France	783	+3%	+3%	+27%
Lombardia	440	+6%	+11%	+23%
Oberbayern	320	+7%	+12%	+53%
Eastern and Midland	263	+10%	+30%	+152%
Madrid	262	+10%	+8%	+32%
Rhone-Alpes	262	+6%	+8%	+30%
Cataluña	255	+10%	+7%	+28%
Dusseldorf	247	+7%	+12%	+35%
Stuttgart	239	+6%	+8%	+41%
Darmstadt	235	+7%	+11%	+38%
Koln	216	+7%	+11%	+42%
Lazio	213	+7%	+5%	+11%
Alpes-Cote d'Azur	207	+8%	+21%	+42%
Noord-Holland	204	+10%	+13%	+56%
Southern	204	+25%	+60%	+301%
Zuid-Holland	200	+11%	+19%	+43%
Berlin	180	+9%	+15%	+67%
Andalucía	180	+10%	+9%	+26%
Veneto	180	+7%	+8%	+22%
Emilia-Romagna	177	+5%	+9%	+23%
Stockholm	174	+2%	+15%	+38%
Hovedstaden	170	+16%	+35%	+82%
Piemonte	146	+5%	+6%	+14%
Hamburg	145	+10%	+16%	+53%
Noord-Brabant	143	+8%	+18%	+52%
Arnsberg	143	+7%	+11%	+35%
Karlsruhe	141	+6%	+9%	+39%
Pays de la Loire	137	+8%	+12%	+36%
Nord-Pas de Calais	129	+6%	+9%	+24%
Toscana	128	+8%	+5%	+19%
Com.Valenciana	126	+10%	+9%	+27%
Aquitaine	121	+6%	+10%	+31%
Campania	119	+7%	+7%	+16%
Bretagne	115	+8%	+13%	+37%
Warszawski stoteczny	114	+15%	+22%	+87%
Schleswig-Holstein	113	+7%	+13%	+49%
Wien	111	+8%	+11%	+37%
Vastsverige	108	+6%	+18%	+38%
Prov. Antwerpen	107	+9%	+17%	+51%
Midi-Pyrénées	107	+5%	+5%	+33%
Helsinki-Uusimaa	106	+7%	+11%	+41%
basque Country	**79**	**+10%**	**+7%**	**+24%**

Several 2022 data are provisional and estimates. Source: Eurostat.

RECORD EXPORTS TO GERMANY

In 2023, the three Basque provinces achieved new historical records in exports to Germany.



Data in millions of euros. 2023, provisional. Source: Eustat.

TOP 30 BASQUE DESTINATIONS

Germany confirms its leadership as the main destination for Basque exports, while the United States and Mexico show the highest annual growth among the main countries in 2023.

	2023	%23/22	%23/08	%23/00	2022
Germany	5,143	+2%	+70%	+181%	5,023
France	4,876	-3%	+38%	+114%	5,016
USA	2,738	+19%	+83%	+249%	2,300
United Kingdom	2,042	+3%	+62%	+166%	1,979
Italy	1,831	+4%	+37%	+108%	1,757
Belgium	1,614	-8%	+58%	+351%	1,747
Portugal	1,439	-2%	+41%	+93%	1,473
Netherlands	1,332	-35%	+204%	+215%	2,043
Poland	806	+9%	+108%	+629%	740
Mexico	714	+24%	+134%	+217%	578
China	707	-1%	+76%	>999%	713
Türkiye	559	-2%	+111%	+248%	568
Czech Republic	509	+8%	+107%	+486%	472
Sweden	388	-8%	+80%	+120%	422
Switzerland	385	+10%	+88%	+358%	351
Austria	372	+9%	+69%	+259%	341
Morocco	364	+3%	+15%	+351%	354
Norway	325	-0%	+137%	+21%	326
Denmark	301	+13%	+157%	+267%	266
Brazil	296	-20%	-11%	-19%	369
Israel	265	+35%	+274%	+343%	195
Romania	261	+12%	+167%	>999%	234
Slovakia	231	+13%	+321%	>999%	204
Hungary	229	-2%	+156%	+231%	233
Canads	210	+3%	+186%	+124%	205
Saudi Arabia	209	+31%	+124%	+477%	160
Japan	198	+26%	+166%	+69%	157
UAE	194	-8%	+37%	+590%	210
Finland	192	-19%	+95%	+273%	237
India	189	+10%	+1%	+623%	173
TOTAL WORLD	**32,645**	**-0%**	**+61%**	**+175%**	**32,721**

Data in millions of euros. 2023, provisional. Source: Eustat.

BASQUE ECONOMY | FOREIGN TRADE

GERMANY, GOURMET OF BASQUE INDUSTRY

THE GERMAN MARKET IS CONFIRMED AS THE FIRST EXPORT DESTINATION OF THE BASQUE COUNTRY, CONCENTRATING 16 PERCENT OF SALES TO THIRD PARTIES IN 2023, WITH 5,143 OF 32,645 MILLION EUROS

The cooling of the economy and world trade slowed the escalation of Basque exports outside Spain in 2023, which amounted to 32,645 million euros, a similar level to that of the previous year.

This general climate did not affect trade with Germany. The sales of Basque companies reached a value of 5,143 million euros last year, 2 percent more than in 2022. At the same time, German sales in the Basque Country reached 3,971 million euros (Eustat data), 5% more than in 2022. This last figure should be taken with caution because of the intra-regional influence in Spain, with large importers in Catalonia and Madrid that can then divert products to other areas.

Via France

Basque exports in 2023 confirmed Germany as the main destination for the second consecutive year, displacing France. Sales in the latter market reached 4,876 million after an annual reduction of 3%.

In Europe, Basque companies increased their sales in the United Kingdom (+3%), Italy (+4%), Poland (+9%), the Czech Republic (+8%), Switzerland (+10%) and Austria (+8%). The strongest increases during the year were recorded in the United States, the third largest destination country, with 2,738 million euros and an annual increase of 19%, and Mexico, with an increase of 24% and 714 million euros.

€ 2,917 MILLION

EXPORTED TO GERMANY IN THE AUTOMOTIVE AND TIRE SECTORS

Results in Germany

A large part of Basque exports is based on the automotive sector. This factor is present in sales to the rest of the world as well as to Germany. This is due to the strong influence of the Mercedes Benz plant in Vitoria, where the Vito and V-Class models are manufactured. To this must be added the strength of the Basque automotive component industry and the weight of the multinational tire companies installed in the Basque Country, such as Michelin and Bridgestone.

As a reference, the Basque motor vehicle sales in 2023 totaled 5,592 million euros, 24% more than in 2022. The German heading added 2,157 million euros, representing an annual increase of 15 percent and 38.6 percent of this heading in 2023.

The importance of the automobile is also reinforced if the headings of motor vehicles, automotive components and rubber products are analyzed together, which are the three main Basque export items in

2023. Their volume reached 9,674 million euros, 3% more than in 2022. Germany showed greater vigor in this field with a total of 2,917 million euros, 30% of the total and an annual increase of 13%.

Another traditional chapter of Basque sales to Germany focuses on machinery. In 2023, these goods totaled 409 million euros (+7 percent year-on-year), representing 10% of the 3,989 exported to the world under this heading in 2023 (+7%).

GERMANY BUYS 409 MILLION IN BASQUE MACHINERY IN 2023

Other metal products, basic iron and first steel processing all exceeded the 200 million euro annual mark in all three cases, although the latter two headings suffered annual declines of 15%.

Purchases in Germany

In the case of imports from the Basque Country, the main groups are practically the same. Motor vehicles amounted to 570 million euros (+2%), an amount that increased to 1,165 million euros (+8%) if motor vehicle components and rubber products are included. In the case of machinery, Basque companies purchased 498 million euros (+8%), while basic steel products reached 366 million (+8%).

As can be seen, the export flows between Germany and the Basque Country reach a high level as a result of business fabrics oriented towards commercialization in third countries. Without forgetting that in both cases they have a significant presence of subsidiaries in both areas.

Valuable products

Another interesting fact about Basque trade with Germany is the weight of products with higher added value. If we take as a reference the weight of exports (928,780 tons), we can see that the growth was much lower than the value in euros: 6.9% compared to 15.8%.

This characteristic was more pronounced in Alava (16.5% in tons versus 26.0% in euros) and Vizcaya (5.4% in tons and 12.0% in euros) than in Guipuzcoa (5.7% in tons versus 10.0% in euros).

GERMAN VEHICLES AND COMPONENTS WERE BOUGHT IN THE BASQUE AUTONOMOUS COMMUNITY FOR 1,165 MILLION EUROS

BASQUE EXPORTS TO GERMANY

Automobiles and their components and tires will be the mainstay of Basque sales to Germany in 2023, with 2,917 million, 56.7% of total exports to the country.

PRODUCT	2023	%23/22	%23/08	%23/00	2022
Motor vehicles	2,157	+15%	+250%	+298%	1,884
Motor vehicle components	440	+3%	-1%	+100%	425
Rubber products	320	+19%	+56%	+170%	270
Other metal products	268	+5%	+34%	+164%	255
Iron, steel and ferro-alloy products	240	-15%	+13%	+133%	283
Other first processing of steel	201	-16%	+37%	+418%	238
General purpose machinery	188	+2%	-3%	+53%	185
Other non-ferrous metals	117	-48%	+26%	+83%	227
Tubes, pipes and hollow sections	110	-9%	+3%	+252%	120
Tubes, pipes and hollow sections	107	+1%	+15%	+28%	106
Machine tools for metal	99	-1%	-30%	+0%	101
Transport equipment n.e.c.	96	+1%	+999%	+999%	94
Engines, generators and electric transfer equip.	92	+9%	+206%	+999%	85
Other special purpose machinery	72	+46%	+168%	+112%	49
Pulp, paper and paperboard	61	-17%	+98%	+88%	73
Other general purpose machinery	50	+1%	+32%	+240%	49
Waste collection	44	-41%	+51%	+167%	74
Other products	39	+26%	+98%	+999%	31
Locomotives and rolling stock	33	+57%	+376%	+609%	21
Other electrical equipment	33	-24%	+81%	+999%	43
Basic chemicals	28	-8%	+273%	+144%	30
Abrasives and non-metallic mineral products	26	+7%	+58%	+172%	25
Plastics products	25	-8%	+129%	+182%	27
Fruit and vegetable processing and preserv.	25	+16%	+999%	+999%	21
Cables and wiring	20	+14%	-41%	+576%	18
TOTAL	**5,143**	**+2%**	**+70%**	**+181%**	**5,023**

Data in millions of euros. 2023, provisional. Source: Eustat.

BASQUE AUXILIARY INDUSTRY RECOVERS

The seven analyzed sectors of activity heal the wounds of 2020 with a profit increase of 187% and a slight recovery in the number of employees.

	2021	%21/20	%21/19	2020	2019	2018
METAL SMELTING						
Staff employed	6,697	+3%	-4%	6,532	6,963	6,963
Staff costs	303	+4%	-2%	291	308	303
Realised investment	47	-17%	-42%	57	82	70
Turnover	1,398	+20%	-3%	1,164	1,438	1,437
Profit for the year	10	-513%	-71%	-2	33	26
METAL CONSTRUCTION						
Staff employed	9,517	+1%	-5%	9,444	10,016	9,951
Staff costs	382	+6%	+2%	362	376	365
Realised investment	38	+32%	-27%	29	52	33
Turnover	1,234	+17%	-7%	1,059	1,333	1,246
Profit for the year	52	+261%	+4%	15	50	39
FORGING AND STAMPING						
Staff employed	6,769	+0%	-4%	6,757	7,057	7,185
Staff costs	328	+5%	-1%	312	330	333
Realised investment	69	-12%	+15%	78	60	86
Turnover	1,744	+7%	-17%	1,636	2,095	2,187
Profit for the year	58	+407%	+15%	11	50	47
MECHANICAL ENGINEERING						
Staff employed	20,289	+1%	-2%	20,161	20,610	20,229
Staff costs	826	+5%	-2%	790	845	826
Realised investment	94	-14%	-42%	110	163	155
Turnover	2,383	+15%	-4%	2,068	2,491	2,489
Profit for the year	84	+914%	-42%	8	145	177
METAL ARTICLES						
Staff employed	14,040	-3%	-8%	14,476	15,339	15,408
Staff costs	627	+0%	-9%	626	691	691
Realised investment	103	+11%	-32%	93	153	115
Turnover	2,385	+14%	-4%	2,086	2,481	2,463
Profit for the year	90	+259%	-3%	25	92	123
COMPUTER AND ELECTRONIC PRODUCTS						
Personal ocupado	6,773	+2%	-4%	6,666	7,038	6,779
Staff costs	268	+6%	-2%	253	273	250
Realised investment	48	+47%	-12%	33	54	52
Turnover	976	+4%	-13%	937	1,126	1,085
Profit for the year	67	+73%	-15%	39	78	84
ELECTRICAL MATERIAL AND EQUIPMENT						
Staff employed	8,335	+1%	-0%	8,257	8,373	8,037
Staff costs	376	+2%	+5%	369	358	338
Realised investment	34	-11%	-10%	38	38	38
Turnover	1,787	+8%	+8%	1,650	1,648	1,618
Profit for the year	31	-24%	-46%	41	57	54
TOTAL SEVEN SECTORES						
Staff employed	72,420	+0%	-4%	72,293	75,396	74,552
Staff costs	3,110	+4%	-2%	3,002	3,181	3,108
Realised investment	433	-1%	-28%	437	601	549
Turnover	11,907	+12%	-6%	10,601	12,612	12,525
Profit for the year	392	+187%	-23%	137	506	550

Staff in units, all other data in millions of euros. Source: Eustat.

BASQUE INDUSTRY IS IN THE WAKE

PROVISIONAL DATA FOR 2022 AND 2023 CONFIRM THAT HEALTH NORMALIZATION AFTER COVID OPENS A WINDOW THAT BASQUE MANUFACTURING COMPANIES ARE TAKING ADVANTAGE OF

Available data on the evolution of the Basque industrial sector confirm the recovery after the COVID crisis. In 2021, the Basque Statistics Institute (Eustat) estimated a 19% growth in revenues over 2020, up to 58,757 million euros. This recovery, moreover, was confirmed with the Gross Value Added (GVA) data for 2021 and 2022. In the first year, GVA reached 16,340 million, which represented an annual improvement of 10.2 %. This momentum continued in 2022 as Eustat set GVA at 18,813 million and accelerated annual growth to 15 percent.

BASQUE AUXILIARY INDUSTRY MAINTAINS SERVICE CAPACITY INTACT AFTER THE CRISIS

The above data show that manufacturing companies held up and maintained the recovery cycle in the following quarters of 2023, albeit on a less widespread basis. Eustat's Industrial Production Index established an annual reduction of 0.5% in 2023, compared to increases of 5.6% in 2022 and 10.0% in 2021. As can be seen, the slowdown after the rebound from the health crisis is already a reality.

Transport equipment strength

However, if we analyze the different industrial groups, we can see that the IPI cooling did not affect some of the most important sectors of Basque manufacturing. Transport Material companies, for example, added a 5.6% rise in 2023, which was added to the 10.5% rise in 2021 and the 10.8% in 2022. Machinery and Equipment, after activity rises of 14.7% in 2021 and 10.3% in 2022, rebounded 2.6% in 2023. And Computer and Electronic Products posted an extraordinary rebound of 21.9% in 2023, following 7% in 2022.

These improvements did not prevent the weak overall balance due to the weaker performance of the Electric power and gas (-11.5%), Petroleum refining (-4.7%), Chemicals (-3.4%), Paper, pulp and wood (-7.1%), Rubber and plastics (-2.5%) and Metalworking (-2.1%) sectors.

For the time being, preliminary data for 2024 have shown increases in car registrations in Spain and Europe, a factor of great importance for the Basque industry due to the weight of these activities in its business fabric (represented by the Mercedes Benz plant in Vitoria as well as for the tire manufacturers Bridgestone and Michelin, the shock absorber manufacturers and the powerful component manufacturing industry and machining, forging, foundry and treatment services).

Work for third parties

The Basque components and ancillary industries are among the densest and most technologically diversified in Europe, a factor that multinationals located in the Basque Country consider to be essential.

As a reflection of their strength -see attached table-, and in spite of the competitive erosion suffered in recent years due to globalization and the displacement of manufacturing centers, the metal foundry, metal construction, forging and stamping, metal engineering, metal articles, computer and electronic products and electrical material and equipment companies have more than 70,000 workers and 12,000 million euros in sales.

It should not be forgotten that the Basque manufacture of machine tools for metalworking accounts for over 70 % of the sector's production in Spain, which is the third largest manufacturer in the EU and the ninth largest in the world.

METALLURGY AND ENERGY RECOVER POSITIONS

The data for Basque industrial GVA in 2022 shows Oil refining, Electricity and gas and Metallurgy to be the groups with the greatest increase

	2022	%22/21	%22/19	2021	2020	2019
Metalworking and metal products	5,681	+16%	+23%	4,902	3,939	4,615
Machinery and equipment	1,891	+8%	+9%	1,750	1,588	1,740
Transportation equipment	1,858	+6%	-9%	1,753	1,721	2,036
Electricity, gas and steam	1,744	+45%	-8%	1,207	1,701	1,895
Rubber, plastics and other non-metallic prod.	1,567	-0%	-0%	1,574	1,383	1,575
Coke and oil refining	1,092	+142%	+233%	451	8	328
Furniture and other manufacturing	903	+10%	+15%	819	806	788
Food, beverages and tobacco	889	+4%	-14%	857	851	1,039
Wood, paper, and graphic arts	761	+10%	+0%	692	621	759
Chemicals and pharmaceuticals	720	+9%	+21%	660	615	595
Electrical material and equipment	628	+2%	+4%	613	607	604
Water supply and sewerage	501	-2%	+3%	511	463	488
Computer and electronic products	464	+5%	-4%	444	419	486
Textile, clothing, leather and footwear	71	+2%	-26%	69	67	96
Extractive industries	42	+14%	+11%	37	35	38

Gross Value Added (GVA) in millions of current euros. Base year 2015. Data for 2022 are provisional. Source: Eustat.

LARGE GROUPS BOUNCE BACK STRONGLY

The end of confinement and the normalization of industrial and commercial activity makes it possible to recover almost all of the activity lost in 2020 in a single year.

	2021	%21/20	%21/19	2020
Electricity	5,937	+32%	+6%	4,492
Iron and Steel/Non-Ferrous Metals	5,687	+54%	+21%	3,698
Motor vehicles	5,547	+11%	-7%	5,005
Manufacture of coke and refined petroleum pr.	5,201	+49%	-11%	3,497
General-purpose machinery	4,234	+13%	-0%	3,750
Other transportation equipment	2,450	+6%	-14%	2,321
Metallic articles	2,385	+14%	-4%	2,086
Mechanical engineering	2,383	+15%	-4%	2,068
Rubber products	2,065	+18%	-1%	1,745
Electrical material and equipment	1,787	+8%	+8%	1,650
Forging and stamping	1,744	+7%	-17%	1,636
Paper industry	1,470	+25%	+5%	1,173
Beverages/Tobacco	1,433	+12%	-15%	1,285
Metal foundry	1,398	+20%	-3%	1,164
Plastic products	1,268	+7%	-7%	1,183
Other food industries	1,244	+1%	-15%	1,229
Metal construction	1,234	+17%	-7%	1,059
Final chemicals/pharmaceuticals	1,187	+17%	+12%	1,018
Computer and electronic products	976	+4%	-13%	937
Sanitation and waste management	942	+19%	+6%	794
TOTAL INDUSTRY	**58,757**	**+19%**	**-3%**	**49,361**

Data in millions of euros. Source. Eustat.

IREKIA

Presentation of the project for the construction of the new BAM Center for Advanced Automotive Manufacturing

CLOSE TO THE MARKET

The research carried out at BAM will be close to market needs and pre-production. The center, directed by Mariluz Villamor (an engineer with more than twenty years of experience at Mercedes), will carry out tests and trials of technological innovations with new materials such as aluminum or steel, opening up the possibility of future industrialization at Mercedes. It also opens the door to other partners, such as Basquevolt, to test new developments in solid-state batteries and verify their adaptation to the EV.

INDUSTRIAL TRANSITION | ELECTRIC VEHICLE

VITORIA PRESENTS ITS CREDENTIALS

THE BASQUE AUTOMOTIVE MANUFACTURING CENTER (BAM) IS EXPECTED TO BE OPERATIONAL IN 2025 IN JUNDIZ (ALAVA, SPAIN)

The automotive industry is in the midst of a transformation driven by new technologies, sustainability and new social behaviors. The European Commission has set a target of zero emissions for the whole economy by 2050, for which the development of electric and connected vehicles (EVs) and electromobility is essential.

In this context, the Basque Country's strategy to position itself in the field of EVs includes the promotion of various public-private development projects, which in some cases will involve the implementation of new industrial and scientific-technological infrastructures for the development of a research network that will increase the technological component of the Basque business fabric.

This is the case of the new BAM-Basque Automotive Manufacturing Center, whose construction will begin in the second quarter of 2024 in the Jundiz Industrial Park, with an initial investment of almost 13 million euros from the Basque Government and the objective of being fully operational in 2025.

More than 20,000 m2

The new building will have 13,938 m2 on two floors (with the possibility of expanding by another 7,000 m2 in a second phase) and will house an ecosystem of companies, training and research centers and innovative initiatives whose aim is to contribute to the digitalized industrialization of a new generation of electrified and autonomous vehicles.

The BAM Center for the Development of Advanced Automotive Manufacturing Technologies will develop process technologies and intelligent systems for manufacturing the electric and connected vehicle of the future. And it will have collaborative research infrastructures to generate this knowledge.

Business protagonism

To this end, Mercedes-Benz, Gestamp and MB Sistemas will participate as founding partners. Already in the first phase, the three companies will require differentiated space to house two specialized work areas: production and research on one hand, and technical and administrative support on the other.

INTELLIGENT SYSTEMS FOR THE ELECTRIC CAR

This commitment to collaborative research will promote the generation of knowledge in the main key technologies for the development of electric vehicles. These include joining, logistics and vision technologies, coatings and quality improvement for the electric car.

It will also enable the development of the flexible and intelligent factory concept for complex multi-technology products and for laboratory testing and validation.

CIRCULAR BATTERY HUB

By 2030, approximately 350,000 tons of lithium batteries from electric vehicles are expected to reach the end of their life cycle. The second life of the battery or its recycling are options that allow a more efficient use of this device, increase the flow of raw materials, reduce the environmental impact of its production and recover critical raw materials.

In order to make progress in this area, the Provincial Council of Gipuzkoa, together with Naturklima, Cidetec and other local companies, has created Zirkular BAT, a new Battery Circular Hub that will promote sustainability and innovation, taking a decisive step towards decarbonization.

Zirkular BAT promotes local businesses

The project aims to create a business community to foster a circular battery ecosystem with global impact. On the one hand, it will promote local companies and, on the other hand, it will contribute to consolidate Guipuzcoa's international position in the energy transition and circular economy.

In this sense, the center will act as a catalyst to advance the diagnosis, disassembly and classification for the recovery of valuable materials from batteries and their reuse, as well as the recycling of components and raw materials. The project foresees the creation of an industrial recycling network that will ensure the circularity of the process.

BASQUE-CCAM LAUNCHED IN SAN SEBASTIAN TO PROMOTE THE MOBILITY OF THE FUTURE

Autonomous driving, connectivity, electrification and shared mobility are four complementary technological areas that can transform the automotive industry in a disruptive way. In this context, the progress towards the mobility of the future has already added another player in the Basque Country, with a view to achieving a cross-cutting position among all actors: BasqueCCAM.

Created at the end of 2023, the Basque Center for Connected and Autonomous Mobility (BasqueCCAM) aims to promote the synergies and opportunities that can be generated within the mobility industry, providing an R&D&I ecosystem for the promotion of technologies and solutions.

Business Partners

Based in the Miramón Technology Park (San Sebastián), it has collaborative partners such as AVL Ibérica, specialized in the development of in-vehicle propulsion systems and ADAS/AD systems testing. The Biscayan company Gertek, focused on urban and interurban traffic management, develops tools to improve the mobility of people and goods; and the Vicomtech Technology Center. Its mission will be to coordinate and promote the implementation of technologies aimed at the development, validation, demonstration and deployment of the CCAM, with the aim of accelerating the arrival of these technologies on the market in the form of products and services.

IREKIA

Presentation of the new center BasqueCCAM

The action plan foresees the promotion of various initiatives, including the creation of a transversal laboratory for the development and validation of CCAM mobility in the region. It also foresees the development of solutions based on big data to exploit the potential of using large volumes of heterogeneous data in the context of mobility. And also the design and implementation of a physical and digital infrastructure to implement the technological enablers of connected and autonomous vehicles.

5G technology from Másmovil and Ericsson

In the roadmap towards this goal, the Másmovil Group and Ericsson have recently been selected to equip their facilities with 5G SA (standalone) technologies, ensuring the flow of information between the different players through the main technologies related to mobility.

The activities envisaged by the new center are framed in the development of

IT WILL PROMOTE A MULTIMODAL TESTING ENVIRONMENT

a large-scale multimodal and multi-environment test environment for the validation of secure CCAM technologies. It will also support the preparation and implementation of a cross-border corridor for the validation and deployment of automated and connected mobility, as well as the creation of new companies and the development of intrapreneurship around the mobility of the future and the training of workers.

DIGITAL ECONOMY | BUSINESS SYNERGIES

BIND 4.0 LAUNCHES 28 PROJECTS

THE 8TH EDITION OF THE PROGRAM BRINGS TOGETHER STARTUPS FROM ALL OVER THE WORLD WITH CONSOLIDATED BASQUE COMPANIES

The eighth edition of the open innovation program Bind 4.0, promoted by Spri, has been launched with the mission of bringing to fruition the development of innovative projects of young SMEs in collaboration with established companies.

In total, around twenty startups will develop a selection of around 30 projects in an acceleration program that will take place this year with the support of two business partners with a long track record in the Basque Country. In total, 70 partner companies such as Iberdrola, Mercedes, ITP Aero, Arteche, RPK, Betsaide or Quirónsalud, among others, have launched the development of solutions for smart industry, clean energy and sustainability, health and food. The projects are driven by disruptive technologies to automate processes through AI, facilitate human-machine interaction in the factory or improve the circularity of industrial processes through sustainable solutions.

EMPRESA XXI

Demo Day 2023 at Euskalduna Palace (Bilbao)

This year, 7 of the selected startups are from the Basque Country and 8 others are from the rest of Spain. The rest are companies from the United Kingdom, Portugal, Singapore and Brazil.

Smart industry

64% of the solutions will be used for smart industry, 27% for renewable energy and sustainability, and the remaining 9% for health and food projects. Among the technologies to be applied in the projects, artificial intelligence, clean tech and robotics stand out and will be used to improve processes and optimize resources in industrial companies.

The projects developed during the 20 weeks of the program will be presented during the Demo Day, which will be held on June 27th in front of companies and investors at the Euskalduna Palace in Bilbao. On the same day, the deadline will be opened for startups that want to participate in the next edition. The deadline for them is March 31st.

5 clusters and 17 SMEs in SME Connection

As part of Bind 4.0, the call for the third edition of SME_Connection for startups and scaleups has also been launched, with the aim of accelerating innovation and transforming Basque industrial SMEs through collaboration with disruptive startups. To this end, the clusters Aclima, Basque Food, Habic,_Eraikune and Uptek, together with 17 SMEs, have presented five sectoral challenges to startups from all over the world.

SMART AND TECHNOLOGICAL COMBINATION

UTwenty startups, seven of them Basque, will develop around thirty projects with business partners in the eighth edition of the Bind 4.0 program.

STARTUP	PARTNER	ORIGIN	VERTICAL MARKET SOFTWARE	TECHNOLOGICAL AREA	TECHNOLOGICAL SUB-AREA
4i Intelligent Insights S.L.	Mercedes Benz	Sevilla	Intelligent Industry	Artificial Intelligence	Natural Language Processing (NLP)
51toCarbonZero	Tubos Reunidos	U.K.	Clean Energy & Sustainability	Software	Sector (industry) cloud platforms / solutions
Acceleration Robotics	Celsa Group, Teknia	Alava	Intelligent Industry	Robotics and electronics	Collaborative robotics
Advanced Algorithms 4 Radar	Orona	Murcia	Intelligent Industry	Robotics and electronics	Collaborative robotics
Aunoa	Betsaide, RPK	Valencia	Intelligent Industry	Artificial Intelligence	Intelligent Document Processing (IDPs)
Birziplastk	CAF, Arteche	Biscay	Clean Energy & Sustainability	Other Technologies	CleanTech
Detektia	Serveo	Soria	Intelligent Ind., Clean Energy & Sust.	Artificial Intelligence	Machine Learning
Goldilock	Elecnor	U.K.	Intelligent Industry	Cybersecurity	Security for networks and distributed systems
Hedro Sistemas Inteligentes	ITP Aero	Brazil	Intelligent Industry	Connectivity and IoT	Sensors and data acquisition
Infinite Foundry	Gestamp Group	Portugal	Intelligent Industry	Immersive technologies	Digital Twin
Kernova	Tubacex	Alava	Clean Energy & Sust.	Other Technologies	Cleantech
Lust 4 food Brands SL	Mondragon BDC	Gipuzkoa	Food	Artificial Intelligence	Other
Orbik Cybersecurity	Arteche	Gipuzkoa	Intellig. Ind. Clean Ene. & Sust., Health, Food	Cybersecurity	Software and hardware security engineering
Recog Analytics	Quironsalud	Madrid	Health	Artificial Intelligence	Natural Language Processing (NLP)
Safeloc Systems	Arcelor Mittal	Gipuzkoa	Intelligent Industry	Connectivity and IoT	Traceab. and geoposit. / Geoloc./ Spatial posit.
Smart Comfort (Nawattia)	Eika, CIE, Vibrantz	Navarra	Clean Energy & Sustainability	Other Technologies	Energy
Uali	Iberdrola	Madrid	Clean Energy & Sustainability	Artificial Intelligence	Image Processing / Artificial Vision
Uktena	Gureak, OBE Hettich	Valencia	Intelligent Industry	Artificial Intelligence	Image Processing / Artificial Vision
Visionaries 777	Ramondin	Singapur	Intellig. Ind. Clean Ene. & Sust., Health, Food	Immersive technologies	Mixed Reality (MR)
We are clickers	Betsaide, Garay, GH Cranes	Biscay	Intellig. Ind. Clean Ene. & Sust., Health, Food	Artificial Intelligence	Intelligent Document Processing (IDPs)

Source: SPRI

DIGITAL ECONOMY | INDUSTRIAL STRENGTH

A SHOWCASE FOR EUROPE

BASQUE OPEN INDUSTRY SHOWCASED CAPABILITIES IN AI, CYBERSECURITY AND MICROELECTRONICS

The celebration of the Basque Open Industry (BOI) in Bilbao, as part of the European SME Week, served to showcase the capabilities of the Basque industrial and technological ecosystem, as well as initiatives to promote the digital transition and the latest trends in advanced manufacturing and emerging applications.

Nearly 2,300 registered attendees witnessed the Basque industrial capacity in fields such as artificial intelligence, cybersecurity, energy, microelectronics and technology, as well as the potential of the hundred exhibitors who showed their innovations.

BASQUE OPEN INDUSTRY ATTRACTED THE ATTENTION OF 2,300 VISITORS

For two days, the Basque Digital Innovation Hub (BDIH) presented success stories related to additive manufacturing, advanced materials, robotics, smart machines and digital health, among others, as well as the Basque microelectronics strategy through the Basque Microelectronics Hub (BMH).

22 BMH projects

Created to revitalize Basque microelectronics through the training of professionals and the promotion of new companies, this initiative already has more than twenty projects and 75 organizations with the mission of accelerating sectoral diversification in line with European industry.

Currently, 70% of technological patents come from China and the United States. In this context, the Basque Research and Technology Alliance (BRTA) reiterates the importance of collaboration between public entities, companies and technology centers to advance on the path of strategic sovereignty and the ability of Basque industry to develop its own technologies.

SPRI

Basque Open Industry activated 800 meetings and appointments between companies

Guía BAIC de IA

The broad potential of AI was evident in the series of conferences organized by the Basque Artificial Intelligence Center (BAIC), which presented a guide with recommendations for applying AI in industry and helping companies identify the processes in which it can be useful.

As part of the conference, international experts explained the challenges that need to be addressed in terms of training and international collaboration, in order to create a network for the exchange of technologies and the creation of infrastructures to address multi-technology projects (AI, cybersecurity, data analytics, etc.).

The BOI also led to meetings with startups specialized in transformative projects in Industry 4.0, AI, cybersecurity, connectivity and IoT, advanced sensors, big data, immersive technologies, robotics, additive manufacturing, machine vision and edge computing.

SUSTAINABLE ECONOMY | CIRCULARITY

BUSINESS COMMITMENT

BASQUE COMPANIES FORM ALLIANCES TO FOLLOW THE EUROPEAN PATH TOWARDS DECARBONIZATION

In the Basque Country, various projects, technology centers and actions are being launched to expand ESG (Environmental, Social and Corporate Governance) criteria and the commitment of companies to sustainability and decarbonization. Examples of this strategy are the recent initiatives launched by Spri, Energy Cluster, Tecnalia, Elkargi or the Chamber of Commerce of Bilbao.

Among them, the Basque Industrial Hub for Circularity (BIH4C), presented in January, is an innovation center for the decarbonization of Basque industry that shows the commitment of companies to the circular economy. The companies Calcinor, Sidenor, SBS Process, Lointek, Petronor Innovación, Smurfit Kappa and Nortegas, together with the Consorcio de Aguas Bilbao Bizkaia, the Energy Cluster and Tecnalia, have joined forces to create the first business and technology hub in the Basque Country to promote decarbonization in different industries. All this through research and implementation of energy synergies, efficient use of resources and technological innovation.

FIRST INDUSTRIAL HUB FOCUSED ON DECARBONIZATION

The aim is to identify opportunities to eliminate emissions through industrial synergies and technological validation, with the vision of reducing CO2 emissions by 20% and the use of material resources, water and energy by 10% of the participating companies in the next few years.

The Hub was created within the framework of the European project IS2H4C, "Sustainable Circular Economy Transition: from Industrial Symbiosis to Hubs for Circularity", which aims to establish new models of sustainable regional development in order to build a cleaner and greener future. The consortium, made up of a total of 31 partners from 9 countries, including the 10 Basque organizations mentioned above, will demonstrate this new model in 4 key industrial hubs in Europe, located in the Basque Country, Germany, the Netherlands and Turkey.

Net Zero Basque Supercluster

In the case of the Basque Country, BIH4C is part of the Net-Zero Basque Industrial Supercluster (NZBISC) initiative, promoted by Iberdrola and Petronor, with the support of Spri, whose objective is to accelerate the drive to reduce emissions in Basque industry, while promoting new opportunities for the territory derived from the development of innovative decarbonization technologies and

BIH4C aims to reduce emissions by 20% and resource consumption by 10%.

TECHNOLOGY ANALYSIS

BIH4C works on the exploitation of **industrial synergies** through the development and demonstration of innovative **decarbonization technologies in real operating environments**. These include hydrogen oxy-combustion in **steel mills**, possibly from oxygen and hydrogen produced by electrolysis in the **refining** sector; CO2 capture in the **lime industry** and its use to produce methane or carbonize steel slag; and the production of building materials in the **cement** sector. Other possible synergies are also being explored in the form of plans to **expand the hub**, such as the production of **biofuels** from industrial by-products such as paper waste or lignin.

TEN BASQUE COMPANIES IN THE BIH4C HUB

THE BASQUE COUNTRY IN THE EUROPEAN CIRCULATION NETWORK

COMPANIES SEEK SYNERGIES ON THE ROAD TO DECARBONIZATION

In order to contribute to the NZBISC initiative, the Energy, Paper, Foundry and Forging, Aclima and Siderex clusters have joined forces in the Dcartech Alliance, with the aim of accelerating the identification of synergies between the industrial fabric and promoting the matchmaking between technological supply and demand for the decarbonization of the Basque energy-intensive industry.

The first meeting of the Dcartech Alliance took place during the celebration of the Decarbonization Forum, in December 2023, demonstrating its role of strategic monitoring of the main trends in technologies and priority solutions around energy efficiency, heat pump and electrification, and oxyfuel and hydrogen.

During the event, the President of the Basque Hydrogen Corridor Association and Deputy CEO of Petronor, José Ignacio Zudaire, and Iberdrola's Director of Service and Procurement, Asís Canales, explained their role in the Net-Zero Initiative and their commitment to decarbonization.

Iberdrola and Petronor's participation

Canales highlighted the electrification of industry as an opportunity for technological development, but pointed out that decarbonization requires large investments and public support.

For his part, Zudaire showed the keys to the "Hard to Zero" project planned by Petronor through the Basque Hydrogen Corridor, in collaboration with eight industrial groups whose geographical proximity favors the implementation of supply networks. Sectors that cannot be decarbonized by direct electrification, such as steel, glass, cement, infrastructure or petrochemicals.

services.

To date, the Supercluster's activities have focused on identifying technological measures to move towards decarbonization in the pulp and paper, refining, cement, iron and steel, and foundry sectors, which account for 70% of polluting emissions.

In order to advance in this direction, a new support program for decarbonization solutions called Innobideak Fast Track is expected to be activated with a budget of 7 million euros to promote the scaling of technological developments to the market.

TECNALIA

ELKARGI AND THE BILBAO CHAMBER OF COMMERCE PUT SMES ON THE PATH TO SUSTAINABILITY

In order to help companies in the Vizcaya region implement a sustainable strategy that contributes to their competitiveness, some organizations have launched support initiatives, such as the Chamber of Commerce of Bilbao and Elkargi, among others.

The Cámarabilbao ESG Hub is a new line of work that aims to help companies face the challenges of integrating ESG criteria in their management and to comply with European legislation, including the obligation to have a sustainability plan in 2026 in order to face the regulations foreseen in 2028.

Within the framework of this platform, SMEs will be able to receive training, identify best practices and policies to promote sustainability, as well as the financial, reputational, legal compliance and market access benefits of ESG management, promoting strategic alliances within the framework of the hub.

EMPRESA XXI

José Ignacio Zudaire, President of the Bilbao Chamber of Commerce, presented the plans of Corredor Vasco.

500 Elkargi SMEs

For their part, the Basque Government and Elkargi have activated the "ESG Euskadi" Sustainability Rating for SMEs project, which will make it possible to measure, evaluate and certify the sustainability of Basque SMEs.

Large companies have access to ESG rating tools, but this has not been the case for SMEs. In the first phase, 500 SMEs, members of Elkargi, of different sizes and sectors have been selected. After the analysis phase, they will receive a report, endorsed by the European Association of Financial Analysts and the Valuation Society, with the company's ESG rating and a set of recommendations for improvement. As a result, they will be in a better position to access financing sources that are increasingly based on sustainability criteria. Kutxabank, Laboral Kutxa and BBVA, among others, are participating in the project.

DIGITIZATION| QUANTUM TECHNOLOGIES

THE BASQUE QUANTUM STRATEGY

BASQUE GOVERNMENT AND PROVINCIAL COUNCILS TEAM UP WITH IBM TO HOST SUPERCOMPUTER

GOBIERNO VASCO

The Basque Country has made a strong commitment to promoting quantum technologies, which is why the regional government and the three provincial councils, together with IBM, are developing the Basque Quantum Strategy, a cross-cutting initiative that aims to contribute to scientific discoveries in different areas of this type of technology, advance its practical application and accelerate its use and exploitation in different business sectors.

A key element of Basque Quantum is the agreement reached with IBM to create a Quantum Technology Center to position the Basque Country as the most advanced center in Southern Europe in this field.

THE BASQUE GOVERNMENT PLANS TO INVEST NEARLY 51 MILLION EUROS

Thanks to this public-private alliance, the Basque Country will soon be home to the IBM Quantum System One computer, the sixth quantum supercomputer in the world, connected to an international network promoted by IBM that also includes the United States, Germany, Japan, Canada and South Korea.

Investment Partnership

The agreement provides for an investment of approximately 51 million euros from the regional government. However, other contributions from the three Basque regional governments will have to be added to this disbursement in order to support research projects, as well as the construction of some infrastructure to meet research needs. In total, the promoters expect the project to reach a direct investment of more than 120 million euros by 2028.

The disbursements will be focused on four main areas: infrastructure, research excellence, training and innovation. Among the most important is a new building for the Ikerbasque Foundation in San Sebastian, which will house the IBM-Euskadi Quantum Computation Center.

Construction is expected to be completed in the first half of 2025, and the computer will be installed in the second half of the same year. However, several users have already been granted remote access to IBM's quantum computing systems and collaboration agreements have been signed with institutions of the Basque Science, Technology and Innovation Network.

Also in the area of infrastructure, part of the indicated investments will be devoted to a new center for the Donostia International Physics Center (DIPC), which carries out cutting-edge research in physics and related disciplines, as well as to new research laboratories.

IBM WILL BE INSTALLED IN THE SECOND HALF OF 2025

Although the strategy was launched only a year ago, a call for joint research projects between the Basque Science, Technology and Innovation Network and IBM Research has already been launched in areas of common interest, with several projects selected within two lines of research excellence: "Error Mitigation for Quantum Dynamics Problems" and "Quantum Kernel Methods for Classification and Detection Problems".

Training

In the area of training, a framework has been adopted for the definition of education and training programs aimed at different levels and agents: Research, Industry and Technology Centers, Higher Education and Vocational Training. In addition, researchers have been trained in quantum computing platforms and tools. In terms of innovation, programs have been launched for the participation of companies in projects with an impact on quantum computing in the business environment.

Other steps already taken at the Basque Quantum have been the appointment, at the end of 2023, of its scientific director, a position entrusted to the scientist Javier Aizpurua. In addition, the inter-institutional committee formed earlier this year will soon set up a steering group to coordinate and promote the Basque Quantum strategy.

This strategy addresses four areas of quantum science and technology: quantum communications, quantum sensing, quantum computing and quantum simulation.

Official presentation of the project in March last year.

Data Economy

Another of the bets on digitalization was the launch, in mid-2022, of the Baidata association, which was born with the vocation of promoting public-private leadership in Spain and Portugal in the data economy.

The association, born from the promotion of the Innovalia Group with the support of the Provincial Council of Bizkaia and the support of the Association of Knowledge Industries and Applied Technology of Euskadi (Cluster Gaia), already has more than fifty companies and aims to develop a public-private data ecosystem through various research, training and development activities.

To this end, Baidata offers its partners the opportunity to connect their business to the data economy through pilot actions, access to the necessary infrastructures to implement shared data spaces, as well as training plans to train companies and introduce them to technologies related to the data economy.

€120 **MILLION** IN DIRECT INVESTMENT PLANNED BY 2028

AXES IN TRAINING, INFRASTRUCTURES, RESEARCH AND INNOVATION

It also aims to contribute to the creation of a European Data Union, promoting the connectivity and interoperability of the territories' data space with other regional and national data spaces and with the common European data market, and serving as a link to European data environments.

CYBERSECURITY: A COMPLETE OFFER

The Basque Country enjoys the strength of having a cybersecurity ecosystem as one of the advantages it has to face its digital transformation process. Public-private collaboration, with strong institutional support in this area, has favored the growth and strengthening of the companies that make up this ecosystem.

In fact, according to the third edition of the "White Paper on Cybersecurity in the Basque Country", the region has more than 79 companies in this sector per million inhabitants, above the ratio for Spain as a whole (28) and the European average (22.8).

This was highlighted during the recent presentation of the publication at a conference entitled "Euskadi digital safe: an ecosystem of reference in Europe", where it was emphasized that the Basque Country is an attractive area for investment in this sector.

Representatives from the Association of Knowledge and Technology Industries (Gaia), the Association of Cybersecurity Companies of Euskadi (Cybasque) and the Regional Government itself stressed that the Basque Country has a wide range of specialized actors that allow it to tackle cybersecurity projects in a comprehensive manner. In fact, it has technology centers, universities, integrators / consultants, distributors / wholesalers or manufacturers at the local level, making it possible to cover all the different links in the sector's value chain.

DIGITIZATION | ARTIFICIAL INTELLIGENCE

PICKING UP THE PACE

THE BASQUE ARTIFICIAL INTELLIGENCE CENTER BRINGS TOGETHER SUPPLIERS AND USER COMPANIES, KNOWLEDGE CENTERS AND PUBLIC ADMINISTRATIONS

FREEPIK

Accelerating the implementation of Artificial Intelligence (AI) in Basque industry in order to increase the competitiveness of its companies was the mission with which the Basque Artificial Intelligence Center (BAIC) was created in 2021. The entity is configured as a public-private collaboration space for the promotion of this technology in the territory, and as a laboratory for experimentation and acceleration of projects. Its objective is to position the Basque Country as a pole of industrial artificial intelligence.

In its origins, the Center was promoted by different types of organizations, including the Basque Government and large companies from different industrial sectors, startups, ICT providers and knowledge agents, such as CAF, Euskaltel, Gestamp, Iberdrola, ITP Aero, Mondragon Corporation, Petronor, Sener, Versia, Deusto Seidor, Inzu Group, the Basque Center for Applied Mathematics (BCAM) and the Vicomtech Technology Center. However, in the two and a half years that followed, new partners joined the initiative, bringing the total to around fifty.

BAIC aims to position the Basque Country as an industrial AI hub.

BAIC aims to create an ecosystem

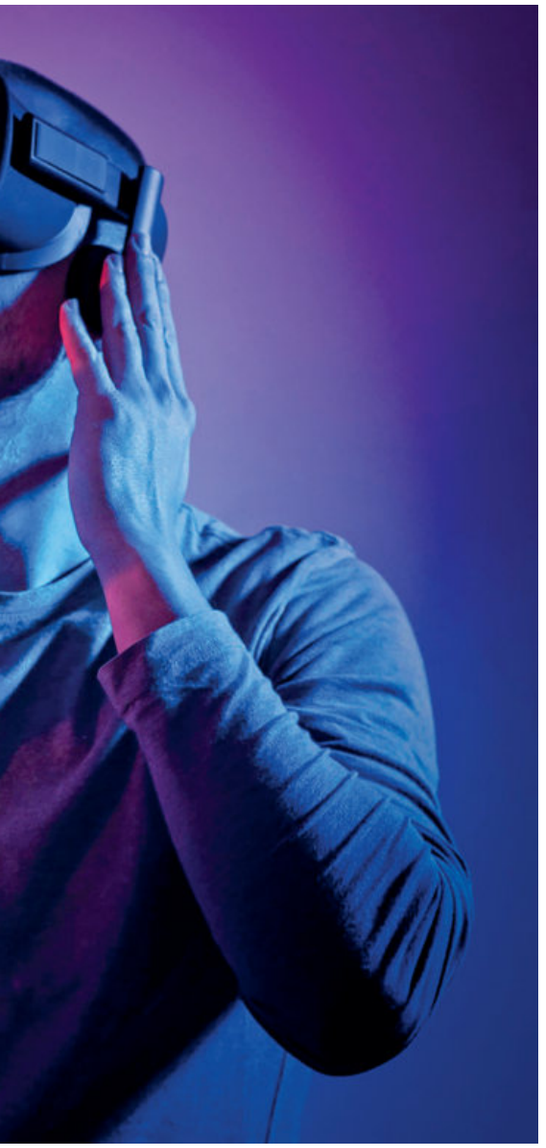
To accelerate the implementation of AI in Basque industry, BAIC has created a collaborative ecosystem that covers the entire value chain: from suppliers to user companies, including public administrations and knowledge institutions such as Basque universities and scientific and technological centers in the territory. In fact, the articulation of this system is one of the objectives of the association, which is also responsible for promoting the creation of new companies in the AI sector by involving local tractor companies.

IT ALREADY HAS ALMOST FIFTY PARTNERS

The BAIC is dedicated to the development of different areas of activity, including a monitoring and reference observatory of the state and evolution of AI in the Basque Country, as well as monitoring international trends, promoting knowledge of this technology by developing, retaining and attracting related talent, identifying use cases and implementing unique pilot projects.

To this end, the Center has carried out the mapping of the AI training offer, in response to the growing demand for skills and talent throughout the ecosystem. Key areas for development have been identified, facilitating the future creation of training programs to meet market needs. Similarly, the mapping of AI agents in the ACBC has enabled the identification of more than 700 relevant actors.

It has also created a catalog of use cases that, while highlighting successful projects, provides a detailed view of how artificial intelligence can address various challenges in industry and public administration. In addition, last year it defined 18 AI use cases that have led to the conception of a dozen potential driver initiatives.



DIGITIZATION | ADVANCED MANUFACTURING

FROM MT TO SMART AND AUTONOMOUS PRODUCTION CENTERS

A PROJECT COORDINATED BY AFM AIMS TO AUTOMATICALLY ADAPT EQUIPMENT TO CHANGING CONDITIONS

Transforming today's machine tools (MT) into intelligent and autonomous production centers, capable of automatically adapting to the changing conditions of production processes and environments, is the objective of the "Missions" project, an initiative coordinated by the Spanish Association of Machine Tool Manufacturers (AFM cluster) and led by the company Nicolás Correa.

In addition to this Burgos-based company, other Basque machine tool manufacturers such as Danobat, Ibarmia, Ona and Zayer are participating in the project, which is supported by the Center for Technological Development and Innovation (CDTI), as well as the Navarre company MTorres and the Riojan company Nidec Arisa.

Also participating in the project are the software solutions provider ATS-Global and technology providers based in the Basque Country, such as the Tecnalia Foundation and the University of the Basque Country, in particular the Center for Advanced Aeronautical Manufacturing (CFAA), as well as the University of Burgos.

Industry 5.0

The project, framed within the guidelines of Industry 5.0 that is currently taking shape in the European Union, aims to achieve a significant advance in the level of intelligence of machines, as well as in their ability to adapt both to the operator and to the rest of the production environment.

Thus, the new generation of machines resulting from this project will be able to learn from previous experiences, program itself and increase its productivity. According to AFM, in the event of unforeseen situations, they will be able to act autonomously to prevent further damage.

In addition, the actions are not performed independently, but are integrated into a collective intelligence within the enterprise that communicates with other machines and with those responsible for the various stages of the production process.

GAIA ACCELERATES THE ADOPTION OF MANUFACTURING

The Basque Association of Knowledge Industries and Technology (GAIA) participates in a working group of the Industrial Forum of the European Commission (EC), which is working since 2021 on a European diagnosis and recommendations to accelerate the deployment of advanced manufacturing technologies and processes, especially in industrial SMEs, to ensure European leadership in this field.

MACHINES WILL BE ABLE TO LEARN FROM PAST EXPERIENCE

AFM


IBERDROLA

Vikinger offshore wind farm in the German Baltic Sea.

BASQUE COMPANIES IN GERMANY | ENERGY

IBERDROLA: FLAGSHIP IN THE OFFSHORE SECTOR

SETS UP A HUB IN THE BALTIC SEA, WITH A WIND FARM ALREADY IN OPERATION AND TWO UNDER DEVELOPMENT, WHICH WILL ADD UP TO MORE THAN 1,100 MW OF INSTALLED CAPACITY

Iberdrola has been present in Germany since the beginning of this century (2001), although its relationship with the German market intensified in 2017 following the commissioning of the 'Wikinger' wind farm, with 350 megawatts (MW) of installed capacity. Taking advantage of the development of this technology in the German Baltic Sea, the Bilbao-based energy group has created an 'offshore hub' with the development of two other facilities: Baltic Eagle, with 476 MW planned, and Windanker, with 300 MW. The total investment will be around 3.7 billion euros.

The 'Wikinger' offshore wind farm, in which Iberdrola has invested 1.4 billion euros, supplies 350,000 households with renewable energy, equivalent to 20% of the needs of the state of Mecklenburg-Western Pomerania, where it is located, and avoids the emission into the atmosphere of almost 600,000 tons of CO2 per year. In 2022, the Basque company signed an agreement with Energy Infrastructure Partners for the sale of 49% of the plant.

Iberdrola's second major offshore wind project in Germany is "Baltic Eagle". Its construction will begin in 2022, 30 kilometers northeast of the island of Rügen, off the coast of Pomerania, and is expected to be operational by the end of this year. It will have 50 wind turbines with a capacity of 9.53 MW each, supplied by the Danish company Vestas, and will be able to meet the annual needs of 475,000 households. This wind farm, in which the Emirati company Masdar is also a co-investor, is an example of collaboration between Spanish and German companies, as its foundations were laid by Windar and EEW SPC.

800 million in 'Windanker'

The third plant, also under development, is called 'Windanker' and is expected to be operational in 2026. It has a planned investment of 800 million and will include new generation, high capacity turbines in the region of 15 MW. The majority of its production is expected to be allocated to long-term power sales contracts in the German market.

In addition to the Baltic Sea, Iberdrola believes that several areas in Germany offer conditions for further investment in renewables and plans to increase its generation activity in solar PV, onshore wind and green hydrogen in the coming years.

Sener, engineering for two thermoelectric plants

Sener is involved in the construction of two thermoelectric plants in Germany. Specifically, EnBW has awarded two thermoelectric plants in Heilbronn and Altbach/Deizisau to a consortium that includes GE Vernova, which is leading the alliance, and Bonatti.

According to Sener, the two plants, which will be powered by H-class gas turbines, are expected to supply nearly 1.4 GW of electricity to the national grid, as well as steam for district heating in Heilbronn and the Stuttgart metropolitan area.

The projects will enable the future combustion of fuel mixtures with up to 100% hydrogen by volume by the 2030s.

According to the Biscayan engineering company, the contracts include the equipment and construction of the plants, as well as software solutions, maintenance and service for a period of ten years.

Each 680 MW plant will replace the existing coal-fired units at Heilbronn and Altbach/Deizisau, and the new plants are expected to come online in 2026. They will be powered by a GE 9HA.01 gas turbine, an STFD650 steam turbine, a W88 generator and a triple-pressure heat recovery steam generator (HRSG) with reheat.

SENER

The plants will be hydrogen ready.

Ormazabal to modernize E.ON's network

E.ON and the Basque company Ormazabal, an expert in network technology solutions, launched a pilot project to modernize the company's network in the Bavarian region at the end of last year.

According to Ormazabal, the aim of the project is to facilitate the integration of renewable energy generation and storage, the electric vehicle charging network and service monitoring.

Specifically, the Basque company has provided E.ON subsidiary Bayernwerk Netz with its technological solution for SF6-free equipment. In this way, a transformer tower was replaced by a new digital substation that incorporates all the technology for network automation and remote control.

Presence in the country

Ormazabal, which has had an industrial presence in Germany for decades, has included this project in its objectives to promote the energy transition and the modernization of the country's distribution network, an area in which it is working to enable the transition to a sustainable model.

BASQUE COMPANIES IN GERMANY | MOBILITY

CAF GAINS WEIGHT

IN THE COMING MONTHS IT WILL DELIVER SEVERAL ORDERS IN BONN AND HANOVER FOR LIGHT RAIL AND BATTERY TRAINS


CAF

Light rail project for the city of Bonn.

The Gipuzkoan company Construcciones y Auxiliar de Ferrocarriles (CAF) has several projects open in the German market. In the next few months, it is expected to deliver a series of light trains for the cities of Bonn and Hanover, as well as several battery-powered trains for the local Nahverkehr Westfalen-Lippe (NWL).

In 2022, CAF signed contracts with the transport operators in and around the city of Bonn, Stadtwerke Bon Verkehrs (SWBV) and Elektrische Bahnen der Stadt Bonn und des Rhein-Sieg-Kreises (SSB), for the delivery of a total of 32 light rail vehicles. These are 28-meter-long, high-floor, bi-directional trains equipped with state-of-the-art comfort and safety features.

Üstra Hannoversche AG

CAF is also supplying a total of 42 LRVs to Üstra Hannoversche AG, Hannover's public transport operator, with the first units scheduled for delivery in the second half of 2025. The contract initialed at that time provides for a possible extension of the contract to manufacture up to 233 additional units.

Battery trains

Another of the Gipuzkoa-based company's notable railway contracts in the German market (where it has also previously won orders for LRVs (55) for the city of Essen and trams (8) for Freiburg) is the supply of 10 battery-powered trains to Nahverkehr Westfalen-Lippe (NWL), as well as the provision of maintenance services for the fleet. These units are scheduled to enter service in 2025 and early 2026. Previously, NWL and Verkehrsverbund Rhein-Ruhr (VRR) had selected CAF to supply a further 63 battery-powered trains.

For this latest contract, the company signed a contract last year to build the digital workshop and maintain the fleet in the period 2025-2058 at the former BWW Bismark site in Gelsenkirchen.

TALGO AT HIGH SPEED

Talgo will supply a total of 79 ICE high-speed trains to Deutsche Bahn, the largest order in the company's history. Last year, the company confirmed an order for 56 new trains, in addition to the 23 ordered by the German company in 2019. The units will be manufactured at Talgo's plant in Rivabellosa, Alava, and are scheduled to enter service gradually from this fall. They are high-tech trains composed of a locomotive that provides traction to the composition of 17 passenger coaches.

SURVEY | ROBOTICS

AN UNTAPPED FORCE

EXECUTIVES FROM INGEMAT, BEREIKER, KUKA IBERIA, ALDAKIN AND INGENERSUN EMPHASIZE THE INCREASING USE OF ROBOTICS AND ITS ABILITY TO OVERCOME CONSTRAINTS SUCH AS REPEATABILITY AND LARGE SERIES

The revolution that robotics is bringing to industry will extend to new sectors and applications. The Empresa XXI survey of managers from Ingemat, Bereiker, Kuka Iberia, Aldakin and Ingenersun reinforces the idea that robotization is under-utilized, while sensorization is already giving robotic systems greater flexibility, which has broken the conditioning factor of their exclusive application to repetitive processes and large series.

> Robots have spread throughout industry, both in large companies and in SMEs. Do you think that companies are taking full advantage of these systems, or are they still limited to very specific sectors?

Adolfo del Campo / Ingemat

From what we see today, there is still an under-utilization of the possibilities that robotization offers at the industrial level. Certainly, there are two sectors worldwide that are largely robotized: electronics and automotive. The rest, especially in some countries (including Spain), are still a long way off.

It should be noted that with 2022 data from the International Federation of Robotics - IFR, the top five countries in industrial robotics implementation in absolute value (number of robots per year) are China, Japan, the United States, Korea and Germany, with Spain far behind (No. 12).

And if we look at the density of robots per 10,000 workers (data also from 2022), Spain falls to 20th place in the world. Korea is in first place with 1,012 robots per 10,000 workers, Germany is in third place with 415 robots, and Spain is at 169.

Therefore, it can be said that their use in Spain is still limited to certain sectors and that there is a wide field of development ahead. And it is worth remembering that there is a direct correlation between productivity and robot density (all linked to companies and sectors with higher added value).

Adrián Guerra / Bereiker

There is still a certain lack of knowledge about robotics and a mistaken tendency to think of high costs when considering the integration of robotics. There is also a lack of knowledge about the flexibility that robots can offer and a tendency to limit their use to specific and known tasks. This is changing thanks to new collaborative technologies that are bringing robotics closer to more and more industries, as it is a technology that offers greater flexibility than traditional robots when it comes to automating certain operations.

Ignacio Sancho / Kuka Iberia

In recent years, there has been a big change in this regard. Initially, robotics was implemented in large industries with high production needs. Basically

in the automotive world. Later, it expanded to other industries, but always with the condition of large size and high production. What we have seen in recent years is an expansion in small and medium sized companies and for all types of industries: electronics, food, aeronautics, etc. There are several reasons for this change: demographic changes, changes in consumption and, above all, the evolution of the range of robots and accessories available.

Today, we manufacture robots with payloads from 1 kg to 1300 kg and reach from 540 mm to 3700 mm. In the same way, there are peripherals on the market that allow us to equip robots with vision or sensitivity, just to mention a few possibilities. This makes it possible to manipulate and process elements with different shapes and textures and in chaotic environments in the same process. This has allowed us to reach all types of industries, from automotive to medical, foundry, food, plastic, stone, pharmaceutical, etc.

Ibai Inziarte / Aldakin

The adoption of robots in industry, both in large companies and SMEs, reflects a growing trend towards automation and operational efficiency. In general, companies are using these systems in a variety of ways, although the degree of adoption and impact varies significantly by industry and company size.

Advantages and benefits of robotics:
1. Increased efficiency and productivity: Robots can operate 24/7 with no downtime, significantly increasing production and reducing downtime. In industries such as manufacturing, automotive and electronics, this capability has been widely leveraged to increase production and reduce costs.
2. Accuracy and quality: In tasks that require precision, such as electronic component assembly or quality inspection, robots can perform the work with greater accuracy and consistency than humans, thus improving product quality.
3. Work in hazardous environments: Robots can work in hazardous or unhealthy environments, reducing the risk to human workers. This is particularly useful in industries such as chemicals, mining, and space exploration.

Limitations and Challenges:
1. High initial investment: Although the cost of robots has decreased in recent years, the initial investment, including integration with existing systems and training of personnel, remains significant, which can be a barrier for SMEs.
2. Lack of flexibility: Although robots are highly efficient at repetitive tasks, they may lack the flexibility to quickly adapt to changes in production processes or to produce customized products, which are increasingly demanded by consumers.
3. Displacement of workers: Automation can lead to the displacement of workers, especially in highly repetitive roles. This poses socio-economic challenges and requires strategies for relocating and training workers.

Sergio Bilbao / Ingenersun

Robotic systems or cells are applicable to all sectors and territories. Companies accustomed to automation are expanding their application and intensifying the robotization of their production. Among them are, logically, those related to the automotive sector, which is undoubtedly the most robotized sector and the one that makes the most use of this technology in combination with other technologies such as machine vision. Other sectors are beginning to use robotics, especially in intralogistics and product handling.

Although the cost of robotics has been decreasing over time, it is true that the cost of robotics justifies its use for low cycle times and serial production, or where there is a need for flexibility and rapid product changeover, in order to have a reasonable payback period for the installation.

Therefore, I would say that it is not limited to very specific sectors, but to operations and productions that justify the investment.

> Is this situation a cliché? Can robots be profitable in short and flexible operations?

Adolfo del Campo / Ingemat

The greater penetration of robots in the market, with the consequent reduction in their costs and increase in their capabilities, undoubtedly justifies their use in increasingly short and flexible tasks.

But I think it is also worth reflecting on the following: until now, investments in robotics have almost always been linked to a business case analysis that would justify the investment economically (with the exception of tasks where ergonomics or the difficulty of the task prevented it from being performed by a worker). And its use was implemented only when the investment had a return that fit the company's financial philosophy. However, the current labor shortage, which will become even more acute in the future, will make it essential to adopt industrial robotics, regardless of the return on investment, because the alternative will certainly be not being able to continue the business…

Adrián Guerra / Bereiker

Yes, thanks to advances, it is now possible to have a single robot that can perform several short-cycle tasks, if it is well configured and if criteria are defined to ensure its operation.
Your costs have been significantly reduced, so the ROI is very clear in many cases. This also makes it possible to think, for example, of having "mobile equipment" that can be programmed as needed for different operations.

ADRIÁN GUERRA
Project manager Robotics & Automation, Bereiker

"THE FLEXIBILITY THEY OFFER IS UNKNOWN"

ADOLFO DEL CAMPO
Managing Director, Ingemat

"THE USE OF ROBOTS IN SPAIN IS LIMITED"

Ignacio Sancho / Kuka Iberia

From this point of view, the use of robots has also changed a lot. Initially, their use was justified from an economic point of view in processes with high cadence and very high production levels.

In recent years, other parameters have been added to the application of automated robotics, such as the reduction of accidents, the need for precision and repeatability, and even the difficulty of covering certain work areas.

This, together with the reduction in the average cost of a robotic application and the flexibility of current technology, has led to the installation of many applications for processes with short and flexible operations. And, in some cases, making flexible applications that allow us to use a robot for different processes of the line with multi-tools, peripherals and mobility.

Ibai Inziarte / Aldakin

The perception that robots are mainly oriented to high cycle and highly systematized tasks comes from the first industrial applications of robotics, where the return on investment was maximized by automating repetitive and high-volume tasks. However, with recent technological advances, this situation is evolving and the concept is gradually becoming stereotypical.

Advances in Robotics for Short and Flexible Operations:
• Collaborative Robotics: Designed to work alongside humans on a variety of tasks, collaborative robotics are inherently safe and easy to program. Their flexibility and ease of reconfiguration make them ideal for short, changing operations, allowing even small businesses to benefit from robotics.
• Machine Learning and Artificial Intelligence: The integration of AI and machine learning allows robots to adapt to and learn from their environment, improving their ability to handle unstructured tasks and make real-time decisions. This makes them more suitable for flexible, short-term operations.

Cost Effectiveness in Short and Flexible Operations:
The cost-effectiveness of robots in short and flexible operations depends on several factors, including reduced hard-

(continued on page 30)

INGEMAT

SURVEY | ROBOTICS

(from page 29)

ware and software costs and the ability of robots to perform multiple tasks without significant intervention for reprogramming or reconfiguration. Innovations in collaborative and adaptive robotics are helping to overcome these challenges, making automation accessible and cost-effective for a wider range of applications, including small batch production, product customization, and operations that require adaptability to different tasks or products. But there is still a long way to go.

Sergio Bilbao / Ingenersun

Especially today, they are used in flexible jobs with short series and high variability. The sensor technology that has been developed in parallel has given them the ability to adapt to the product to be processed, allowing them to make quick reference changes. For example, in our robotic brake disk painting lines, we can now paint disks with random production, using different reference models of brake disks at the same time. The robots paint different areas of the disc depending on the model that arrives at their painting station, without having to change the program or make an adjustment stop. In this way, we bring total flexibility to production.

Another example is tire depalletizing with 3D vision, which allows us to have different pallets with different tire references in the depalletizing bays. The robots depalletize according to the model that the vision tells them is in the bay. They are no longer tied to repetitive tasks and long production runs. On the contrary, they now provide flexibility and profitability in the face of short production runs.

ALDAKIN

> Robotics and digitalization are two key elements of the last decades. Is the arrival of AI and machine learning already a reality for robots?

Adolfo del Campo / Ingemat

In our opinion, and based on what we see on a daily basis, there is no doubt that both will be key elements, but we are still at the beginning of the use of AI and the development of self-learning in robotics.

Now is the time to learn and become familiar with this environment in order not to miss the train of what is sure to be an industrial revolution.

Adrián Guerra / Bereiker

It is still early, this field still needs to be developed, but in many cases, such as identification, artificial vision, etc., it is getting closer to being a reality. It is still necessary to go deeper, but the trend is that in a very short time AI will be a reality that adds value to robotics.

Ignacio Sancho / Kuka Iberia

AI and self-learning are already a reality in the world of robotics, albeit at the moment in very specific aspects. One example is predictive maintenance, which can be performed by learning from the behavior of different robot components to anticipate possible failures and reduce downtime. This is just one example, but it is proof of what is to come, which will change the world of automation, increasing efficiency and effectiveness.

Ibai Inziarte / Aldakin

My view of the current reality:

- Adaptive robotics: Robots equipped with AI and machine learning capabilities can adapt to new environments and learn from their experiences. This is especially useful in changing or unstructured environments, where robots can improve their performance over time without detailed manual programming.
- Continuous Improvement: Through self-learning, robots can optimize their actions based on feedback from past performance. This allows them to perform complex tasks more efficiently and accurately, even in situations that were not explicitly programmed.
- Human-Robot Interaction: AI has also improved the ability of robots to interact more naturally and effectively with humans, adapting to their needs and learning from their preferences.

My view of the mid-term future:

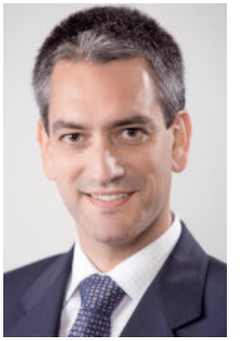
- Generalization: While many current robot systems are designed for specific tasks, the future points to more generalist robots, capable of performing a wide range of tasks without the need for extensive reprogramming. AI and self-learning are key to achieving this flexibility.
- Integration of senses: Advances in AI will allow robots to not only "see" or

IBAI INZIARTE
R+D Director, Aldakin

"ROBOTISATION MUST BE INCLUSIVE"

SERGIO BILBAO

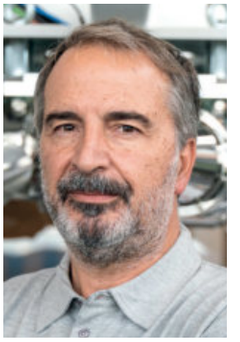
Commercial & Quality Manager, Ingenersun



"SENSORS HAVE BROUGHT NEW POSSIBILITIES"

IGNACIO SANCHO

Sales Director GI, Kuka Iberia



"ROBOTICS IS PRESENT IN ALL SECTORS AND SMES"

"touch", but also to integrate multiple senses in a manner similar to humans, enabling richer perception and understanding of the environment.

•Full autonomy: Robots are expected to achieve increasing levels of autonomy, making complex decisions and performing tasks without human intervention, based on their ability to learn and adapt to new situations.

Sergio Bilbao / Ingenersun

AI, deep learning, algorithms, etc., are much talked about and there are many examples, true, but in my opinion they still have a long way to go. I always say this from the industrial point of view of the production process. It may be that in other areas, especially in digitalization, it may be more applicable. But in a robotic cell in a production environment, AI and deep learning, for example, I think they are not so directly applicable.

Let's just say that today a robot performs the tasks that it has programmed, which can be variable to perform tasks in a flexible way, but it does not have the ability to change its criteria according to its own learning.

> Are robots and the robotization of capital goods the most realistic alternative to maintain the main economic activities in the West and to mitigate the demographic collapse?

Adolfo del Campo / Ingemat

I partially answered this question in my response to the second question.I believe that, given the lack of human resources, the only viable alternative will be the use of robots, a situation that we are already seeing in countries with serious problems in this regard, such as Japan and the United States.

But, to give a pragmatic answer, in many cases it will not necessarily be a reflection directly related to the demographic collapse, which I believe will be the case in many of the most advanced economies, such as those mentioned above, as well as Germany, Korea, etc.; but it will also be an essential element of competitiveness for companies and countries. Those that do not opt for this development will be at a competitive disadvantage to those that do.

Adrián Guerra / Bereiker

It is a bit bold to make predictions in this context. But in the face of a possible labor shortage in the future, robotics and automation can help fill certain positions. Robots will be able to automate repetitive and low-value tasks, but there will still be jobs that require humans to think, reason and make decisions to make sense of the whole. Today, at least, not everything can be automated (thankfully).

Ignacio Sancho / Kuka Iberia

Robotics must be at the service of people, making their lives easier. Robotics is not only a means to produce more, but it can help us to produce better, with higher quality, more efficiently and, above all, to eliminate painful or even dangerous jobs. We are not talking about replacing jobs with robots, we are talking about giving people very powerful tools to do the work.

Ibai Inziarte / Aldakin

Robotics offers a number of potential benefits to address demographic challenges, especially the aging and shrinking of the workforce:

1. Increased productivity: Robots can increase the productivity of companies, compensating for the decrease in the available workforce. This is critical in industrial sectors where demand for products continues to grow.
2. Maintaining competitiveness: Automation allows Western economies to remain competitive with countries with lower labor costs and younger populations, ensuring that production remains in these regions.
3. Innovation and development: Investments in robotics and digitalization technologies drive innovation and the development of new products and services, creating new economic opportunities.

Social and employment aspects: Robotics also raises important social challenges and considerations:

1. Labor market transformation: Automation can lead to a transformation of jobs, replacing certain tasks with robots while creating new opportunities in areas such as programming, robot maintenance, and management of automated systems.
2. Inequality and re-equalization: There is a risk that robotization will exacerbate inequality unless effective reskilling and training policies are implemented gradually for affected workers. It is crucial to ensure that the transition to a more automated economy is inclusive.
3. Changing industrial relations: Robotics could change the nature of work and labor relations, raising questions about the value of human labor, identity, and purpose.

Ethical and cultural considerations: The mass adoption of robots also raises ethical and cultural questions about the relationship between humans and machines, the right to work, and how societies value and allocate leisure time.

Sergio Bilbao / Ingenersun

What is clear is that more automated and robotized countries have a higher quality of life and a higher per capita income. On the other hand, robotization generates a somewhat traumatic transition moment, because it requires a higher level of education from the population, and those who do not have it must adapt, and if they do not, it becomes difficult to find jobs.

Many of the jobs where you used to find operators are now being robotized, such as anything that has to do with handling parts that do not add value to the product, only cost. Robots and AGVs are here to stay. A lot of robotics projects are related to intralogistics, for example. In addition, as I mentioned earlier, sensors have advanced, giving robots new capabilities. They are now also able to depalletize bulk products using 3D vision. So, in many cases, incoming material and outgoing finished goods can be handled by robots. Collaborative robotics even allows for human-machine interaction. The work of humans is more focused on decision making, technology, robotics, etc., and less on traditional manual manufacturing operations.

SURVEY | DIGITIZATION

A PATH OF NO RETURN

EXPERTS FROM LANTEK, SISTEPLANT, AYESA, LKS NEXT AND SEMANTIC SYSTEMS AGREE THAT INVESTING IN DIGITALIZATION IS A KEY FACTOR FOR THE SURVIVAL OF COMPANIES

The heads of Lantek, Sisteplant, Ayesa, LKS Next and Semantic Systems stress the importance of investing in digitalization to ensure the competitiveness and survival of companies, always, of course, within the limits of each company's possibilities. These experts emphasize that a comprehensive and consistent strategy must be developed over time to manage these processes.

In general, is investment in digitalization commensurate with its importance for the future?

Juan José Colás / Lantek

It is really very difficult to make generalizations about investments. Each company faces very different problems, situations and circumstances.

I would say that companies are starting to understand the competitive advantages that digitalization and technological transformation bring to the business, so in that sense the scenario is different from what it was years ago.

Ana Santiago / Sisteplant

The last few years have marked a paradigm shift, companies are aware of the need, although there are still differences between sectors. Investments are being made, but there is still a need for a disruptive leap and a clear horizon for transformation. If we think about industry, there is still a long way to go in terms of implementing demand forecasting tools, real-time process monitoring and control of process variables, and asset lifecycle management, to name a few.

José Manuel Barrutia / Ayesa

The level of investment varies and is usually related to the size of the company, the sector in which it operates, and the strategic vision that the organization has in this regard. In any case, there is a clear trend: companies are inevitably interacting more intensively with their customers, suppliers and/or allies through the so-called digital ecosystems. In this sense, companies have already understood the significance (opportunities and risks) that digitalization brings to their market and business model.

When it comes to allocating budgets and investments to digitalization, companies are at different stages of maturity depending on when they started to address the challenge of digitalization. For example, some companies are investing in cloud migration projects, data analytics and cybersecurity, while others are more advanced, with targeted investments in process automation and artificial intelligence. In all cases, it is essential to have suppliers with the experience, solvency and quality of service recognized in the market to help and accompany them in their digital transformation projects.

JUAN JOSÉ COLÁS
Chief of Sales and Marketing Officer, Lantek

"THE DIFFERENTIAL FACTOR WILL BE THE VALUE OF DATA"

Jesús Dorronsoro / LKS Next

In general, companies invest in digitalization based on the expected return on that investment. Sometimes, they invest in digitization because of a market need or to facilitate compliance with regulatory requirements. More often than not, they invest out of a need to improve their own internal productivity by digitizing processes and freeing up their people to focus on more value-added tasks. It is the different operational areas that are increasingly demanding more digitization to improve their productivity and results.

José Ramón Valle / Semantic Systems

Obviously, the answer varies depending on the company, its sector and its size. In general, however, we see that many companies recognize the importance of digitization and are making significant investments in it.

Getting the digitization process right is critical to the future of any business. More than simply optimizing costs or increasing sales, it is the difference between survival and extinction. If investment in technology is viewed as an expense, and the company does not allocate sufficient resources to digitization, whether due to a lack of understanding of its relevance, a lack of available resources, or resistance to change, it runs the risk of being left behind in an increasingly digitized business environment.

Conversely, an organization may over-invest in digitization without a clear strategy, failing to digitize what really matters and irrevocably wasting money. At Semantic Systems, we believe it is critical that companies carefully assess their needs and capabilities before making significant investments in digitization, develop a solid digitization strategy that is aligned with their business objectives, and work with a digitization expert partner to provide the methodology and support for their digitization processes.

Are companies taking a comprehensive approach to IT and digitalization, or are they taking a piecemeal approach? Do you see this as a deficit?

Juan José Colás / Lantek

It is not easy to make long-term plans with a global scope, the evolution of most companies is usually given by projects. Progressing piecemeal can be an effective strategy for companies that do not have the resources for a comprehensive strategy, or for those that need to adapt quickly to changes with specific solutions.

However, one of the maxims we always share with our customers is the fundamental importance of how data is organized and related. Respecting the data model will keep it consistent, which is critical to ensuring that it is accurate and useful. Therefore, regardless of the digitization project we are carrying out, it is essential to pay attention to the integration, traceability and quality of the information, which will avoid errors, help solve problems and allow us to make informed and accurate decisions.

Ana Santiago / Sisteplant

Often, partial implementations are made with digital improvements that are not connected and therefore have less impact, as they are not necessarily optimal to achieve the final goal.

A global vision of the value chain is essential, starting from the heart of the factory, where things happen, strengthening the processes in a practical way to be able to adapt en masse, efficiently and without losing sight of how the market is behaving.

José Manuel Barrutia / Ayesa

There are companies (usually large organizations) that take a comprehensive approach, with a holistic view of how to transfer their strategic vision through digitalization. This is undoubtedly the most effective way to approach it, as it is a process that affects the entire organization, and not

only the IT area, but also the organizational culture, employee training, business processes, etc. However, and often due to budgetary constraints, it is common to find fragmented approaches, which are sometimes ineffective as they make cohesion between systems and leveraging new capabilities more complex.

From a strategic point of view, not having a medium-term vision of the impact of digitalization on the business environment in which the organization operates would be considered a deficit, regardless of whether this strategy is translated into projects that are staggered over time depending on budget availability.

Jesús Dorronsoro / LKS Next

Companies, like everything else, have limited resources, and it is normal that in most cases they face digitization processes in a fractional or piecemeal manner. There are very few cases in which it is faced globally in a short period of time.

We must not forget that a digitization process, in addition to an economic disbursement, involves a more or less profound change, but a change in the organization, in the processes, in the training of people and even in the relationship with suppliers or customers, as the case may be.

What is a mistake is not to have a comprehensive strategy that allows to have already traced a path to face the different phases of digitalization. A digitization strategy designed to be implemented in a specific time frame, whose actions in one area take into account the implications in the others, which prioritizes actions based on different factors... All this will allow us to face a more effective digitization process with lower costs. In short, it will avoid mistakes along the way and allow us to face the following phases in a more orderly manner. Of course, the implementation of this strategy requires an initial investment, and many companies do not see it as an investment, but as an expense, because the first result of this part is not the effective digitization of any process, but the design of this digitization. This is where the mistake lies, in not carrying out this strategy and prior planning.

José Ramón Valle / Semantic Systems

We always make a mistake when we generalize and, as in everything, there will be companies that carry out their digitization processes in a comprehensive manner and others that do it in a more fragmented way, more "by leaps and bounds", influenced by specific needs within their company or by passing fads.

At Semantic Systems, we always approach a digitization project in a comprehensive manner, keeping in mind that you need to digitize what really matters. Every company is unique and knows what it is that adds value to the market that needs to be digitized. At Semantic, we understand that digitization is not just about digitizing this or that process in a fractional way, or implementing an existing tool without further ado, but that digitization is a key integral process for the growth of a company. That is why we carry out every digitization project based on our methodology, which includes 6 fundamental points: Consulting (what to do and why); Engineering (how to do it and who does what); Planning (when to do it); Execution (project implementation); Validation (project validation); Managed Service (maintenance and indicators).

› Have companies exhausted the possibilities of public support in this area, or do you think the programs are not enough?

Juan José Colás / Lantek

For many companies, the public aid programs may have been an incentive to start their digitization plans, but it is not advisable to stop there. Although we have been hearing for months that a new public aid package could be approved in the future - which we hope will happen - we cannot rest on this possibility. It is essential that companies continue to take steps towards digitization in order to remain viable and achieve their business goals.

The ultimate goal is to improve the efficiency of the business and the return on investment, so that the project is self-financing; the worst thing that can happen is to abandon the project halfway through.

Ana Santiago/ Sisteplant

The good news is that there are still many opportunities to be seized. It is true that aid has not always arrived as quickly as we would like, but this is changing. In any case, we cannot rely on public aid to carry out digitization projects. Each company must carry out its digitization plan independently. The projects must be good in themselves. If there is aid, all the better.

José Manuel Barrutia / Ayesa

Many companies have taken advantage of aid and subsidy programs aimed at digitalization and innovation. Part of the NG-EU funds have been earmarked for this purpose, both for large companies and SMEs. In some cases, the aid is mainly for technical advice to help companies that are still in the early stages of digitalization. It is true that in some cases there have been delays in terms of allocation and implementation, which is particularly relevant when we are talking about highly changing and dynamic technologies.

Be that as it may, in order to have a competitive business environment that incorporates the latest technological trends, it is essential to have effective public-private cooperation programs that are aligned with the demands of the digital age. In short, it is not that they have fallen behind, but that a continued commitment is needed to avoid being left behind by other economies or regions that are investing decisively and sustainably in emerging technologies.

Jesús Dorronsoro / LKS Next

In my opinion, neither. The digitalization process of a company is not something that has a beginning and an end. It is a constant evolution: as technology evolves, so do companies' digitalization needs and opportunities. This means that digitization support programs also evolve. These programs always focus on two aspects: support for SMEs, which usually have the greatest financial needs for their development, and the adoption of emerging digital technologies, which provide a great increase in competitiveness in driving companies in the territory.

Therefore, companies will always welcome support for the digitalization project to be developed, and administrations will always allocate resources for it. However, given that public resources are limited, it is logical that they also prioritize on the basis of the stimulating effect of this aid. But a digitization process should not be undertaken because there is aid. A digitization process should be undertaken because it is profitable in itself. Linked to the previous question, the design of a digitization strategy helps to improve this profitability.

José Ramón Valle / Semantic Systems

We are aware of the importance of public support as a vital resource, especially for SMEs, as it allows them to access technologies that might otherwise be inaccessible due to the cost of implementing these technologies. These programs also have the potential to foster innovation and facilitate companies' access to new technologies, which is essential in an increasingly competitive and digitized business environment.

ANA SANTIAGO
CEO, Sisteplant

"THERE IS STILL A LONG WAY TO GO TO REACH THE CYBER FACTORY"

JOSÉ MANUEL BARRUTIA
Senior Chief Strategy Officer, Ayesa

"INVESTMENTS MUST BE SUSTAINED OVER TIME"

(continued on page 34)

SURVEY | DIGITIZATION

(from page 33)

> Digitalization seems to be entering a new revolution. Are companies aware enough of AI, connectivity or cybersecurity?

Juan José Colás / Lantek

We are talking about technologies that are multifaceted and, above all, constantly evolving, which brings with it an infinite number of new opportunities, but also numerous challenges. At Lantek, we are convinced that our customers are in good hands and that their management teams are aware of the opportunities and challenges that these new technologies bring.

In order to move forward with confidence and make the most of digitalization, it is essential to have the most reliable technological allies who can help provide a holistic view of the various aspects of each of these technologies. In this way, you will be able to discover what they can bring to your business and what risks they may entail, in order to make decisions accordingly and with the maximum knowledge available.

Ana Santiago / Sisteplant

The revolution started years ago, especially when we talk about connectivity and cybersecurity, although there is still a long way to go to reach the cyberfactory of the future. The level of implementation of AI in industry is just beginning. In the coming years, we will see a bigger progress in this area. Sisteplant has been developing machine learning applications for industry for years and they are already a reality.

José Manuel Barrutia / Ayesa

They are increasingly aware of the impact of these technologies and how other companies are using them. Again, the level of maturity varies. This is logical because the path and, above all, the degree of adoption of each technology is different.

In connectivity, for example, the importance of connectivity and accessibility is already fully recognized and understood. However, it is true that everything related to the Internet of Things (IoT) and next-generation networks (5G) does not have the same relevance for some sectors as for others; and perhaps their adaptation is slower than expected.

In the area of cybersecurity, the growing threat of cyberattacks is raising awareness among companies, and we are seeing an increase in investment in this area. In addition, everything related to industrial cybersecurity is particularly relevant. Once again, it is necessary to have specialized and recognized suppliers that take a holistic approach to cybersecurity, both IT (systems, infrastructure) and OT (plant, operations).

When it comes to AI, companies are generally at an early stage of adoption. If 2023 was the year to understand and explore the opportunities this technology can bring, 2024 will be the year to clearly define how each organization wants to position itself in this regard and take steps in terms of adoption. What we are seeing is that the speed at which everything related to AI (tools, investments, capabilities, etc.) is happening is much faster than with other technologies, so it is easy to be displaced by competitors.

Jesús Dorronsoro / LKS Next

In fact, we are at the beginning of a new revolution. AI was already here, but generative AI has arrived to disrupt everything, along with process robotization, big data, and IOT. And quantum computing has yet to explode. As with any revolution, embracing these changes in a short period of time is complicated. Only the most capable companies, I insist, capable, which is not the same as big, can embrace it and not just embrace it but turn it into an opportunity. The rest, the vast majority, will adopt the various disruptive technologies to the extent that either their non-adoption is a problem for them or their adoption is an obvious opportunity. The most obvious example is cybersecurity.

Five years ago, talking about cybersecurity in industry was almost preaching in the wilderness. As machines have been connected to each other and as these connections have been extended to customers, suppliers or activities in the field, it has gained some importance, and when a cyber attack has stopped the factory, whether its own or that of the competition, it has been when the convenience of implementing quality cybersecurity has really been assumed.

José Ramón Valle / Semantic Systems

There is a growing awareness that ICTs have become key. They are no longer perceived as isolated elements of the business, but as fundamental pillars for business survival, and therefore all companies invest in technology to a greater or lesser extent. However, each company advances in its digitalization process at its own pace, after a thorough analysis of its specific needs, and without being influenced by emerging trends or technologies.

For example, it would not make sense to adopt AI if key processes have not yet been digitized or if cybersecurity is neglected within the company.

Fagor Automation head office

JESÚS DORRONSORO
Technological consultancy Director, LKS Next

"IT IS A MISTAKE NOT TO HAVE AN INTEGRATED STRATEGY"

> Even though you are still in the early stages, which disruptive technologies do you think should make their first steps as a strategic factor in the medium term?

Juan José Colás / Lantek

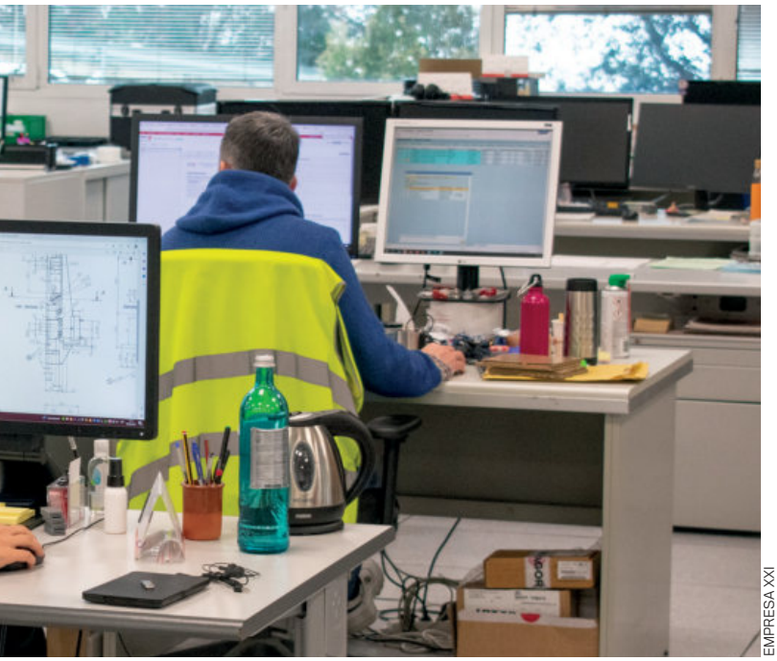
Technology applied to data processing is the key to a company's digitalization strategy, since the differentiating strategic factor that a company can count on will always be the value extracted from the data.

On the other hand, I would like to highlight AI as an element that can improve efficiency and open up new business opportunities. It is not for nothing that it is already present in production optimization processes, in patterns, or in the detection and correction of errors.

Its integration with other technologies, such as IoT and robotics, opens up even more opportunities for innovation, from information gathering to autonomous execution of complex processes.

Ana Santiago/ Sisteplant

Clearly, all those that help to control the process to improve an agile and efficient response. We are talking about hyper-connected MES systems, advanced CMMS with predictive and other functions, machine learning systems and other AI applications with an impact at different points of the industrial value chain (planning, traceability, maintenance, agile adaptation of processes...).



EMPRESA XXI

José Manuel Barrutia / Ayesa
Cloud projects, data analytics, process automation, cybersecurity, artificial intelligence and robotics are the most prominent. Augmented reality and virtual reality are also making progress, although they've had different phases of greater and lesser popularity or, let's put it this way, traction and interest. We cannot forget quantum computing, where there are already sectors and companies taking advantage of its benefits. Advanced connectivity (5G, edge computing) is particularly relevant in some sectors, as it reduces latency and improves the efficiency of data processing. There are also key technologies in everything related to digital identity, blockchain, advanced biometrics, etc.

Jesús Dorronsoro /LKS Next

As I said, size is not necessarily synonymous with advanced digitization. It's curious because we can also see that large companies have highly digitized areas and others that, on the contrary, have not gone beyond the Excel sheet. In my opinion, anything that involves process automation, whether management or operational, is where we should invest. But where all companies really need to invest immediately is in data quality and data protection.

If we are going to automate processes, if we are going to use AI or generative AI, if we are going to connect our teams and share information, we have to make sure that the data that is being captured, stored and transmitted is good. Otherwise, all the automation will fail, because decisions are made based on the data, and the automation, the AI in your case, takes that data as the basis for a decision and action. If the data is bad, the decision and the action will be bad. If that data is exposed, in the best case, our competitors or our customers will be able to take it and use it, and in the worst case, a cybercriminal will be able to hijack it, manipulate it, and even put us out of business. So the first thing to do is to work on the quality and protection of the data.

José Ramón Valle / Semantic Systems
It will depend on the needs of each company, not because it is a very disruptive technology or because it is "fashionable" it is necessarily positive to implement it in our company. Any digitization process in a company needs a methodology that starts from an analysis, from a consulting phase in which it is necessary to assess what is really important to digitize, from there each company has to assess what contribution of improvement one or another technology will provide.

JOSÉ RAMÓN VALLE
Marketing Director, Semantic Systems

"SIGNIFICANT INVESTMENTS ARE BEING MADE"

> A complicated question, given the avalanche of new developments and capabilities: How many years before a company becomes obsolete in terms of digitalization?

Juan José Colás / Lantek
I would not talk about time periods, the evolution is permanent and rapid, so either you have a solid technological base and a clear awareness of the issue, or you are already outdated. As I said, technology alone does not change sectors, and the industrial world is a good example of this. The recent technological advances alone (Internet, 3G/4G, cloud computing, IIoT, AI, Big Data...) have not caused real disruption in an overarching way, but rather by combining them with others that came years ago, such as automation and robotics. The impact of the new technologies is in the air, waiting for new catalysts to make their benefits clearly visible in the P&L. In order not to miss the opportunity when it comes, it is essential that companies have the appropriate technological structures and systems in place for the rapid implementation of the application best suited to that effect or catalyst.

Ana Santiago / Sisteplant
The key is to think through the roadmap and the specific applications to be implemented. This requires a deep reflection on why and how to incorporate new applications and the impact on our business.

The second recommendation is the scalability of the solutions; the roadmap must be reliable and allow for consolidation and improvement to make leaps in the future.

José Manuel Barrutia / Ayesa
It depends a lot on the size and the sector in which you operate. For example, we have seen the transformation of the banking sector, the media and entertainment sector, etc. In these cases, in a few years, many companies could have become obsolete, not so much in terms of their internal systems, but in terms of their interaction with their customers, who increasingly demanded new channels and forms of relationship.

In other cases, such as industry, companies (especially small ones) may have a little more time, but we must not forget that in a globalized world, you can be displaced quickly. Sometimes it is as basic as having efficient ERP and CRM systems that are adapted to new technological trends; and this is not always the case, there are still many companies that maintain systems that are partially obsolete or soon will be.

In short, the key to avoiding obsolescence is to analyze the market and competitors; and to make a strategic and sustained investment over time. This is more effective than investing at a given moment and then not doing so for a few years.

Jesús Dorronsoro / LKS Next
As I said before, digitization is not a start-and-stop process, but a continuous process. This applies to the company and to any type of organization. It is a progressive and ongoing process. In my opinion, it is like the training of people: the training and evolution must be continuous throughout the professional career. Digitization in the enterprise must be a continuous process with a strategy defined from the beginning.

José Ramón Valle / Semantic Systems
The digitalization process of a company is characterized by its continuous nature. It is necessary to move away from temporary updates and adopt an approach of continuous improvement.

This process requires methodical planning that identifies and prioritizes the critical elements of the value chain for effective digitization. It is necessary to digitize what really matters, what helps to sell more, to reduce costs or to be more sustainable, which requires a deep reflection on which aspects of the value chain really need to be digitized. This deep reflection allows for a gradual and strategic implementation, tackling increasingly complex projects.

The company is thus engaged in a spiral of continuous digitization, constantly adapting to the demands of the environment and optimizing its operations in line with the latest technological trends.

TECHNOLOGY | RECYCLING

CEIT CLOSES THE CIRCLE OF ELECTROMOBILITY

CEIT IS WORKING ON THE RECYCLING OF HIGH VALUE-ADDED RAW MATERIALS WITHIN THE FRAMEWORK OF THE "EKOMUGI" PROJECT, FOCUSING ON STRATEGIC ELEMENTS SUCH AS NEOMIDIUM OR NICKEL

The new European law on critical raw materials sets out several measures to ensure sustainable access to strategic raw materials in the EU, thus reducing dependence on third countries. One of the targets is to recycle at least 15 percent of consumption by 2030.

Based on this challenge, the CEIT Technology Center has joined the "Ekomugi" project, which aims to research technological solutions for the recovery of waste from the transport and electric mobility sectors, thus closing the life cycle of products containing strategic elements such as neodymium or nickel. To this end, they will start with the valorization of electric motors, batteries and metallized plastic parts from electric vehicles.

ELECTRIC MOTORS AND BATTERIES, AS WELL AS PLASTIC PARTS ARE EVALUATED

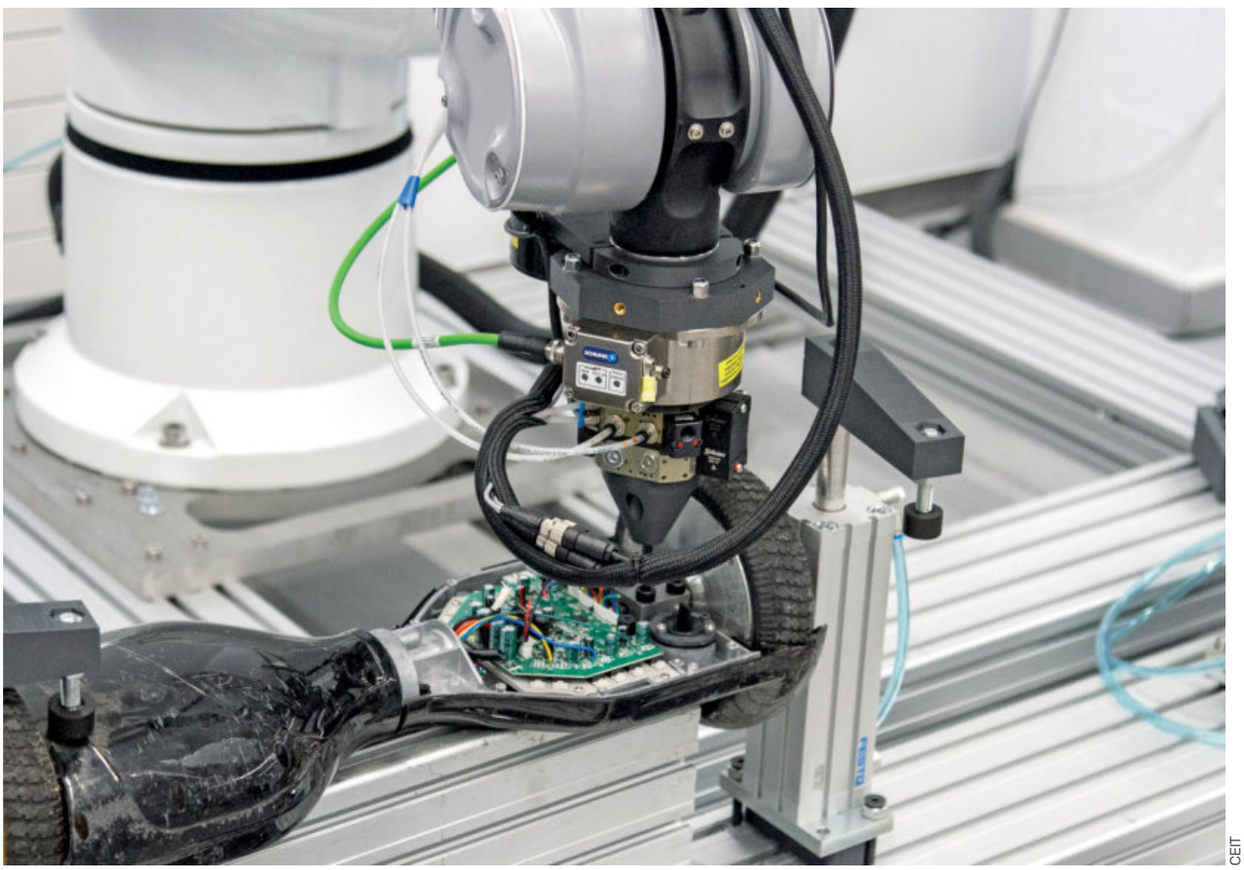
Research will focus on strategies for automating the treatment of these wastes, as well as on innovative technologies for recycling and recovering critical raw materials. Once neodymium and nickel have been recovered in the form of powder and salts, they will be studied for incorporation into manufacturing processes such as electrochemical baths or MIM (Metal Injection Moulding), with the aim of launching a new generation of sustainable components for the transport and electric mobility sectors, according to the Technology Centre.

Artificial vision

Three Ceit groups are working on the project, with different roles. On the one hand, the Intelligent Systems for Industry 4.0 group is collaborating in the development of automated battery disassembly systems using artificial vision techniques for electric products. The center already has experience in this area, for example through the Reeproduce initiative.

The Advanced Manufacturing in Powder Metallurgy and Laser group is involved in the demagnetization and classification of these materials. As they explain, once the material is obtained, it is gas atomized in Ceit's atomization facility. Meanwhile, the Electric Vehicles and Distributed Grids group will work on characterizing the motors to evaluate their performance.

The "Ekomugi" project is led by the company Indumetal Recycling, with the collaboration of other waste recovery companies such as Ecomagnet, Innovation Tree and Birziplastik, the industrial automation company Fegemu and the manufacturing process companies MIM-Tech and Maier. Also involved are the environmental knowledge agent Global Factor and two end users: Maier, a manufacturer of metallized plastic parts for the automotive industry, and Obeki, a manufacturer of electric motors with applications in various sectors. The initiative is complemented by the knowledge and technologies of the Ceit, Tecnalia, Gaiker, Cidetec, MTC and UPV-EHU centers.



CEIT

Ceit works on automation systems.

IDEKO

Ideko encourages robotic activity within 'Cogniman'.

TECHNOLOGY | ROBOTICS

IDEKO TAKES THE STEP TOWARDS COGNITIVE INDUSTRY

PROMOTING THE ROBOTIZATION OF THE MANUFACTURING INDUSTRY WITH THE EUROPEAN PROJECT 'COGNIMAN'

The Ideko Technology Center is one of the fifteen entities that have joined forces and know-how in the European project 'Cogniman', which aims to develop and validate a concept of cognitive digital industry for smart manufacturing in Europe by combining powerful key and cross-cutting technologies such as digital twins, advanced sensing, artificial intelligence and robotics. All these digital tools will be concentrated in a modular "toolbox" with a human-centered design, capable of easily adapting to variable manufacturing environments and new processes.

The ultimate goal of Cogniman, which is coordinated by the Norwegian research center Norce, is to increase the competitiveness of the European technology and manufacturing sectors and drive them towards industrial leadership in international markets, as well as to reduce the environmental footprint of manufacturing activities. To this end, Cogniman has selected four manufacturing scenarios: fiberglass production, precision machining, additive manufacturing of medical implants, and flexible manufacturing.

IT IS WORKING ON A ROBOTIC SYSTEM FOR DEBURRING PARTS

As part of the initiative, Ideko will promote robotization activities in manufacturing industries. It will provide research services on robotics, cognitive mechatronics, technologies, and AI-enhanced robotics for industrial automation.

Robotic system

In turn, it will participate in solving the precision manufacturing scenario by developing a robotic system based on an industrial manipulator robot on a mobile robot for deburring large metal parts that requires minimal human intervention and the ability to perceive and adapt to its environment and process. The system will be digitized and connected to a digital twin that will allow the previous simulation of the work.

Ideko collaborates in this development with the companies Goimek (high precision machining) and Aldakin (electrical systems, automation and robotics) and the Technological Institute of Aragon, Itainnova.

AZTERLAN REFINES THE METAL RECIPE

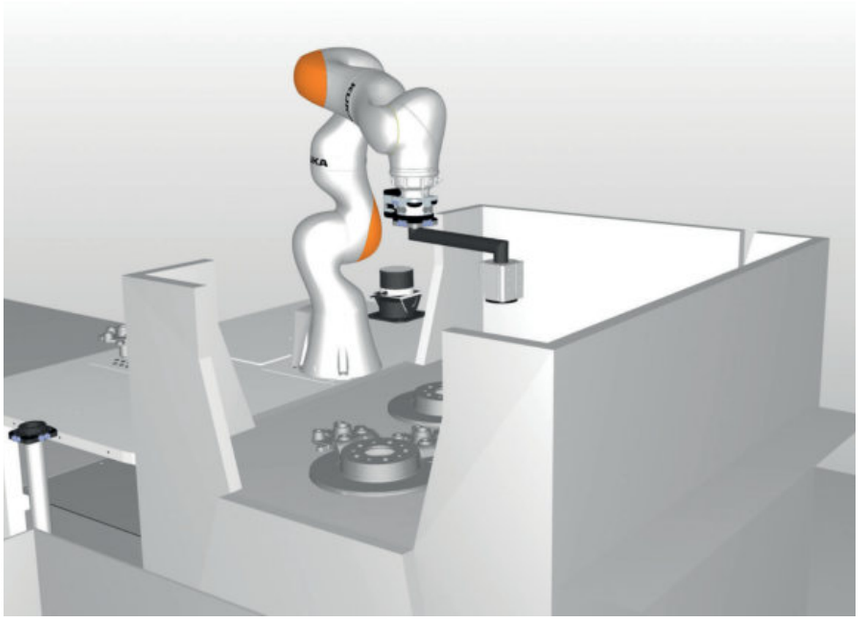
More than ever, foundries need to make progress in controlling their manufacturing processes in the face of factors such as energy costs, problems with the supply of certain raw materials and improving their sustainability. And melting is one of the critical points in the process, as it is one of the stages that defines which materials and alloying elements will be used to achieve the target chemical composition.

In order to intervene in the melting stage and guarantee the quality of the metal at all times, the Azterlan Technology Center has developed an intelligent system that allows the optimization of metal charges based on the availability, cost, quality of raw materials and requirements of the parts, adjusting the metal "recipe" to the target metallurgical quality. This innovative system links in real time, through a digital twin of the process, the information related to the availability of the material used as melting charge in the storage silos, the certificates verifying the chemical composition of these materials, their cost and the data from the plant control plan. In this way, the characteristics of the metal are evaluated based on the thermal analysis techniques and chemical analysis available in each foundry. On the other hand, an intelligent algorithm monitors in real time both the metallurgical quality and the concentration of unwanted trace elements in the casting, as well as the treatment of the molten metal. From all this, it calculates an optimal mix of raw materials at the lowest possible cost, ensuring in all cases the minimum metallurgical quality required to produce each reference.

AZTERLAN

Iron foundry system interface.

As Azterlan points out, in addition to ensuring the reliability and efficiency of the process, the main objective of this development is to reduce as much as possible the cost of the raw materials and alloys needed to produce the base metal.



TEKNIKER

Tekniker will develop an AI based solution.

TECHNOLOGY | ROBOTICS

TEKNIKER REACHES OUT TO INDUSTRY 5.0

LEADS THE IMPLEMENTATION OF FIVE ROBOTIC MANIPULATION DEMONSTRATORS IN THE 'HARTU' PROJECT

The automation of production lines can be a complex task when there is a large variety of parts and low production volumes, requiring very advanced technology and knowledge. With the challenge of bridging this technological gap, Tekniker has been coordinating since last year the European project "Hartu", framed in the Horizon Europe program, with the aim of developing new solutions that contribute to making robotic handling systems more flexible and versatile. A challenge that will be met until 2025, together with fourteen organizations from the EU, Turkey and Taiwan.

In its facilities, the Technology Center is working on the implementation of five demonstrators in different sectors: order picking for a car manufacturer, preparation of materials for subsequent assembly, sorting of fruits and vegetables, order picking in logistics centers, and palletizing of products. The last two cases are being developed in collaboration with Ulma Handling Systems, an engineering company and participant in the initiative.

OFFERS SAVINGS IN FILLER AND ALLOY MATERIALS

AI and simulation

For all these cases, Tekniker will develop a solution based on artificial intelligence, artificial vision and simulation techniques that will allow the system to autonomously learn the best way to handle a part without having seen it before. At the same time, he will investigate how to achieve the manipulation of delicate or fragile targets with a wide variety of shapes and materials using a new gripper concept based on electro-attachment technology. This system makes it possible to generate high adhesion force with minimal pressure, reducing the possibility of damaging the product during handling.

LORTEK DIGITIZES PIPE MANUFACTURING

The Lortek Technology Center is accompanying the historic pipe manufacturer Hijos de Juan Garay in its digital transformation by collaborating on its "Garay Smart Welding Line" project, which aims to digitize high-frequency welding lines and achieve greater flexibility and efficiency. The initiative represents a decisive step in the modernization of the traditional industrial process, combining decades of experience with the most advanced technological innovations that allow access to data.

After defining the most relevant variables of the production process to be monitored and performing a diagnosis of the existing sensor systems, the initiative evaluates the quality of the data collected, correlates it with the final quality of the welded tubes, and provides a comprehensive view of the factors affecting both quality and manufacturing efficiency.

As Lortek points out, additional sensors have been considered to enrich the available data set and provide new critical data to monitor the process and ensure product quality. This is the case of the use of laser profilometry to obtain the geometric parameters of the pre-weld tube part layout and the weld seam.

Today and in the ongoing project, the data and models generated by the systems are centrally integrated into an IoT platform in the cloud. This tool allows real-time monitoring of critical process variables, as well as access to a historical record that concentrates all accumulated knowledge. It also provides full traceability of manufacturing conditions and line configuration. The centralization of this information helps the engineering teams make decisions and facilitates the development of joint continuous improvement strategies for the Oñati and Mexico lines.

HIJOS DE JUAN GARAY

Hijos de Juan Garay plant in Oñati.

TECHNOLOGY | DIGITIZATION

IKERLAN MIXES ITS TECHNOLOGICAL COCKTAIL

THE 'EMSIA' PROJECT COMBINES EDGE AND CLOUD SOLUTIONS TO IMPROVE THE MANAGEMENT AND STORAGE OF RENEWABLE ENERGY THROUGH ARTIFICIAL INTELLIGENCE AND CYBERSECURITY

Ikerlan will optimize energy management based on its own research project 'Emsia', a multi-technology initiative that aims to improve the guarantee of energy supply, increase the level of self-consumption and reduce electricity bills. According to the initiative's coordinator, Haizea Gaztañaga, "Emsia combines edge and cloud solutions to optimize the management and storage of renewable energy through digital technologies such as artificial intelligence and cybersecurity.

The R&D project started in 2022 with the design, modeling and simulation of a digital plant twin, in which AI-based control algorithms of the EMS (Energy Management System) were validated for different generation, storage and consumption configurations. In 2023, the EMS was deployed and validated on an edge cloud platform designed and customized for this type of application.


IKERLAN

Ikerlan research team.

In 2024, as the first relevant milestone, the EMS system will be implemented in Ikerlan's facilities in Arrasate (Gipuzkoa), in order to optimize the self-consumption levels of its headquarters and to experimentally verify and validate, on a real plant, the improvements introduced by the new Emsia architecture.

Amazon Web Services (AWS) is a strategic partner in the project, as its technologies have enabled the development of AI algorithms, according to Ikerlan.

Large-scale validation

The center has developed and validated the solution on a small scale at its Galarreta Energy Laboratories in Hernani.

The results indicate 100% self-consumption, 53% self-sufficiency, and an average annual reduction of 11% in electricity bills.

In the course of 2024, the solution will be implemented on a large scale at its Arrasate facilities, with the aim of optimizing the self-consumption levels of the Technology Center. In 2021, 300 photovoltaic panels will be installed at this site, producing up to 100 KW and providing 20% of the energy needed to carry out its daily activities, avoiding the emission of 50 tons of CO2 per year.


TECNALIA

Tecnalia is working intensively on quantum technologies.

TECNALIA BRINGS INDUSTRY INTO THE QUANTUM REVOLUTION

Tecnalia has joined Hazitek's Q4Real project, led by Ayesa, with the aim of creating an algorithmic knowledge base and computational approaches in the quantum computing paradigm, focusing on real problems in Basque industry.

The initiative will develop a knowledge base and components for different types of quantum computing problems, in addition to generating quantum software engineering practices to close the gap with the commercial solutions market.

As stated by the Technology Center, an extensive portfolio of algorithms and software modules for quantum computing has been generated to minimize the risk of adoption of these emerging technologies in industrial demand, while ensuring a meaningful and frictionless fit of these technologies into industrial business processes.

The project has selected industrial problems that are scalable in complexity related to operational optimization, classification and simulation. Specifically, these are problems of routing, packaging optimization, real-time asset improvement, network comparison, task scheduling, and anomaly detection. All of them obey an optimization purpose that seeks an operational improvement, a better fit in the work chain or in the market offer and a higher added value per person.

THEY WILL CREATE A KNOWLEDGE BASE FOCUSED ON REAL PROBLEMS

A BIG ALGORITHM AND SOFTWARE MODULES PORTFOLIO HAS BEEN GENERATED

Tecnalia acts as the technical coordinator of the "Q4Real" consortium, which is also creating new technical developments for computing that take advantage of the properties of quantum mechanics and that, as it announces, will gradually form a new generation of infrastructures for the operation of society in the near future.

GUGGENHEIM BILBAO

2024 ART PROGRAM

Giovanni Anselmo: Beyond the Horizon
February 9 – May 19

Signs and Objects: Pop Art form the Guggenheim Collection | bbk
February 16 – September 15

Metahaven: Chaos Theory
February 22 – June 9

June Crespo. Vascular
March 1 – June 9

Martha Jungwirth | Occident
June 7 – September 22

Anthony McCall: Split Second
June 20 – November 10

Yoshitomo Nara | Fundación BBVA
June 28 – November 3

Hilma af Klint | Iberdrola
October 18 – February 2, 2025

Paul Pfeiffer
November 29 – March 16, 2025