Industrial Strategy in Practice:

Innovation and Management Best Practices in the Automobile, Energy and Aerospace Clusters in Bizkaia

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Table of Contents

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Executive Summary

This paper presents research undertaken in Bizkaia in the Basque region that 'peels the organisational layers' to assess the management practices of 10 firms. These firms are drawn from the automotive, energy and aerospace clusters that have achieved international recognition, positioning Bizkaia as a prominent region for innovation and production. Firms were assessed using leading methodology developed by the LSE with McKinsey and Co that quantifies management practices and provides a comparison with comparable firms globally.

This paper commences with a review of the socio-economic environment in the Basque Country and Bizkaia, to provide the socio economic backdrop in which firms operate and draw their resources form. This is followed by a review of the facilitators to innovation and social development including the role of the Administration, technology hubs and other factors.

The next sections of this paper introduce the three clusters in the Basque Country, providing an overview of their operations, size, economic contribution, employment and other attributes. This is followed by the presentation of the anonymised consolidated results for the assessment of management practices for the 10 participating firms.

This paper concludes with two short case studies encompassing both a private firm and a firm belonging to the world's largest cooperative, that is worker-owned and controlled. This model eptiomises the socially-driven ethos prevalent in both this type of firm and non-cooperative firms in Bizkaia and the Basque Country, that seeks to foster social 'well-being' with commercial success.

Overview

Commencing in the 1980's, the Government of Bizkaia has pursued a knowledge *creation* versus a knowledge *transfer policy* to foster long-term innovation and growth, with innovation centres and technology parks a cornerstone of this approach. Firms in Bizkaia are amongst the 1,377 firms that received R&D subsidies from the Basque Government's almost €250 million R&D budget, reflecting one of the highest percentages of gross domestic product invested in R&D. In addition, firms in Bizkaia and the Basque Country spend over half of their R&D within their location, but obtain only one-third of their revenue locally with exports often exceeding production by over 2:1. This indicates a concentration of higher value-added innovative activities and advanced manufacturing, facilitated by double the European average of working scientists and over 40% of workers holding higher education degrees, eclipsing the EU average.

The Basque Country has a firm industrial base that accounts for 23.5% of its Gross Domestic Product (GDP)[1] and provides a diversified base that contrasts many other regions in Spain. Bizkaia's industrial and social development policies contribute significantly to this, including the creation of leading global clusters. Many of Bizkaia's firms form part of the clusters in the Basque Country that contribute significantly to GDP, including the energy cluster: this has 343 companies with a global combined turnover of €46.8 billion, a presence 67 countries,[2] and employs 63,000 people globally, including 21,000 in the Basque Country.[3] The automotive cluster in the Basque Country has over 300 suppliers generating a global turnover of €16.5 billion, and accounts for 22% of the Country's GDP and €470 million spend in R&D.[4] The third cluster reviewed, aerospace, has 47 major companies with global revenue of €1.93 billion, exporting of €1.3 billion, and employing 12,440 people worldwide.[5] It contributes 5.8% to the Spanish industrial GDP and has doubled in size since 2006.[6]

Using leading methodology developed by the LSE with McKinsey and Co and applied to 20,000 firms in 25 countries since 2005, the results from the 10 sample firms in Bizkaia position them in the top 5th percentile of firms assessed to date. This reflects best practices being present across 18 key areas assessed in operations, monitoring and performance measurement, and talent management. Firms in Bizkaia also reflect a strong 'social contract' between companies, employees and the surrounding communities that is not confined to co-operative businesses and their charter in this area. Regional success however extends beyond firm-level factors: Bizkaia utilises *engaged innovation* that brings together Government, industry, and academic and learning institutions.

The Province of Bizkaia reflects the long-term benefits that can accrue from a sustained policy of innovation-stimulation and knowledge-creation through direct 'intervention' by Government. A partnership with industry is essential if the benefits of R&D are to be commercialised however. Bizkaia displays a successful balance between government commitment, industrial engagement and social development that have created leading global clusters, learning institutions, and the highest Gross Domestic Product (GDP) of the three Basque provinces, with economic performance ahead of Spain and many EU countries.

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[1] http://www.spri.eus/archivos/Invest-in-the-Basque-Country_BIGlittle_brochure_English_2016.pdf
[2] Cluster Energia supplied data, 2017.
[3] Ibid.
[4] https://Bizkaia.bizkaiatalent.eus/en/pais-vasco-te-espera/apuesta-de-futuro/automocion-estrategico-economia/
[5] Ibid.
[6] Ibid.

1. The Basque Country: A Regional Backdrop Fostering Success

"The capacity to construct a dynamic regional long-term strategy, tailored to the strengths and weaknesses of the Basque economy has played a vital role by giving coherence to public and private talent mobility policies," (p88).

The Global Talent Competitiveness Index, 2015–16

Bizkaia forms part of the Basque Country. The Country is one of the most important industrial concentrations in Spain, with aerospace, automotive and energy amongst the strongest sectors.[7] The Country has a population of 2.17 million people[8], covering a total area of 7,230 km[29], yielding a relatively high population density of 300 people/km^2.[10] The population is comprised of 251 municipalities in three provinces- Araba, Gipuzkoa and Bizkaia- with a population of 0.32 million (15%), 2.138 million (52%) and 0.71 million (33%) respectively.[11] The largest geographic Country is Araba/Alava with 3,047 km², followed by Bizkaia with 2,217 km² and Gipuzkoa with 1,980 km.²[12] Chart 1 depicts the population and geographic coverage of the Country.

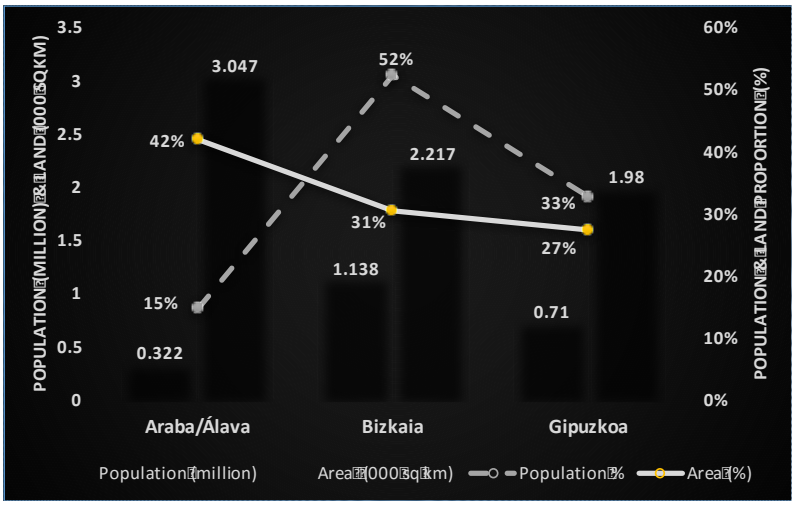

Chart 1: Basque population and geographic area

The Basque Country has a high degree of industrialisation compared to Europe and Spain, reflected by key drivers such as the highest percentage of gross domestic product (GDP) invested in R&D: this was over 2.12% in 2014.[13] This is significantly higher than Spain's average of 1.3%, and exceeds the EU average of 2.06%.[14] Industry also contributes around one quarter of the Basque Country's GDP, with this facilitating the attraction of higher skilled resources.[15] This is indicated by the presence of double the European average of working scientists at 1.3%, and with 43% of those aged between 30-34 holding a university degree, in-line with the Spanish average, and above the EU average of almost 38%.[16]

[7] https://ec.europa.eu/growth/tools-databases/Regional-innovation-monitor/base-profile/basque-country
[8] http://en.eustat.eus/elementos/ele0011400/ti_Population_of_the_Basque_Country_classified_by_year_of_birth_according_to_Historic_Territory_an_sex_on/tbl0011424_i.html#axzz4YZbuOSAP
[9] http://en.eustat.eus/indice.html#axzz4YZbuOSAP
[10] Ibid
[11] https://ec.europa.eu/growth/tools-databases/Regional-innovation-monitor/base-profile/basque-country
[12] Ibid.
[13] http://Bizkaia.the-report.com/reports/basque-country/united-it-stands/investing-in-the-basque-country/
[14] Ibid.
[15] Ibid
[16] http://ec.europa.eu/dgs/education_culture/repository/education/tools/docs/2015/monitor2015-spain_en.pdf

The Basque Country continues to display strong productivity with growth rates above average GDP per capita levels and the second highest per capita GDP in 2015 in Spain at €30,459:[17] this is marginally behind Madrid (€31, 812)[18], and 35% higher than the national average.[19] GDP growth was 5-7% per annum in the late 1980s, and around 5% in the late 1990s.[20] Few Countries in Spain have experienced similar growth rates. The Basque Country's average annual growth of 3.41% from 1997-2007 exceeds other Spanish Countries such as Madrid or Catalonia with growth rates of 2.37% and 2.07% respectively, and many other OECD Countries.[21] The Basque Country also has a low ratio of debt to GDP at 12.1%, versus the Spanish government's almost 90%. The regional unemployment rate of 14% is also around half of the national rate.[22] The Basque Country's labour productivity (GDP per worker) continues to grow after the Great Recession of 2007-2009, with the Country combining the highest gross salary and the shortest working hours in Spain to yield the third highest labour productivity rate in Europe and [23] This is ahead of the UK's labour productivity (13th place), and is the highest in Spain: 26% higher than the Spanish average.[24] These factors have contributed to Standard and Poor's (S&P) rating the Basque Country an 'A' in 2016.[25]

A number of factors promote sustainable long-term productivity and continued regional development in the Basque Country: (i) a proactive business-focused administration; (ii) market-leading clusters with 1,660 international companies amongst a total of 5,000 companies;[26] (iii) a well-educated workforce; (iv) a support network encompassing access to labour, 'living factors' for employees, transport and logistical links, and other infrastructure and related elements. These have contributed to the development of the Basque Country as a location for many international organisations in addition to the entry of local companies, creating a network of suppliers and prime contractors in clusters. The development of a cluster strategy has been a long-term process and reflects significant commitment from Government commencing in the 1980's, and contributing to the development of industry in the provinces.[27] This has moved through three phases in the Government's 'territorial' research and innovation strategy for smart specialisation (RIS3) as defined by the European Commission: (1) industrial restructuring (1980s); (2) efficiency (1990s) and (3) innovation (2000s).[28] The current challenge in the 2014-2020 period is the implementation of RIS3 as part of the Science, Technology and Innovation Plan 2020 (STIP 2020). This includes a focus on two key areas: strengthening regional governance mechanisms as part of RIS3, and the further development of the entrepreneurial processes.[29]

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[17] Orkestra (2008). Report on Competitiveness in the Basque Country: Towards a Unique Value Proposition, Basque Institute of Competitiveness: Deusto Foundation, Donostia/San Sebastian, Spain.

[18] http://Bizkaia.madrid.org/cs/Satellite?cid=1158849749280&language=en&pagename=Inversor%2FPage%2FINVE_contenidoFinal

[19] http://Bizkaia.ogasun.ejgv.euskadi.eus/contenidos/informacion/7071/es_2333/adjuntos/Basque_Country_RU_May_13_2016.pdf

[20] Ibid.

[21] OECD (2011). Reviews of Regional Innovation OECD Reviews of Regional Innovation: Basque Country, Spain.

[22] https://ec.europa.eu/growth/tools-databases/Regional-innovation-monitor/base-profile/basque-country

[23] Eurostat, NE, 2015 data.

[24] Ibid

[25] http://Bizkaia.ogasun.ejgv.euskadi.eus/contenidos/informacion/7071/es_2333/adjuntos/Basque_Country_RU_May_13_2016.pdf

[26] http://Bizkaia.spri.eus/en/invest-in-the-basque-country

[27] http://Bizkaia.ewi-vlaanderen.be/sites/default/files/bestanden/Cristina%20Oyon_Cluster%20policy%202.0%20in%20BC_EWIFocus_12052014.pdf

[28] Orkestra (2016/17). Implementing RIS3. The Case of the Basque Country.

[29] Ibid.

2. Socioeconomic Background

2.1 Bizkaia Economic Overview

"The Bilbao Metropolitan Area has roughly one million inhabitants and its global companies make it a leading city in southern Europe," (p88).

The Global Talent Competitiveness Index, 2015–16

The Province of Bizkaia's economic performance positions it ahead of Spain and many EU countries.[30] In 2016, Rating Agency Standard & Poor (S&P) rated the Basque Country as an 'A' with a 'stable' outlook.[31] This is two-notches higher than Spain's rating (BBB+/Stable/A-2). Economic factors that contribute to the Basque Country's rating and strong economic position are common across the three Basque provinces:

- A high export-orientation and competitive industries.
- A focus on internationally diverse markets that reduces the reliance on Spain's economy.
- A high fiscal autonomy to the National Government through an independent financial system that does not depend on central funding to a significant degree.
- Bizkaia's and the other province's constitutionally protected tax regime.
- The Country's insulation from involvement by the Spanish National Government through the of its special constitutional status.
- A strong management of finances that has resulted in local economic indicators and economic development that exceeds the rest of Spain.[32]

S&P has reported that, *"the Basque Country's economy is wealthier, more competitive, and more export-oriented than Spain's."*[33] In addition, the rating agency Moody's has indicated that, *"the Basque Country is rated- together with the Diputación Foral de Bizkaia- at the top range for Spanish Regional and Local Government's (RLGs)…The Country's ranking reflects the greater legislative and financial autonomy provided under its current institutional framework, its satisfactory budgetary position and a low, albeit rapidly growing, stock of debt*."[34] Within this milieu, Bizkaia's economy has displayed strong growth: between 2011-2015, the Province recorded the only financing surpluses of the Basque provinces, contrasting the Basque Country that recorded a financing deficit in 2015, although underpinned by a fundamentally strong economy.[35] Chart 2 depicts the change in GDP volume and at current prices between 2013-2016 between Bizkaia, the Basque Country and Spain, indicating that Bizkaia marginally lags these two over this period, with overall similar GDP results. Economic activity in other areas in Bizkaia has significantly outperformed both of these, with Building Works showing an 844% increase in 2016 versus 2015 for Bizkaia, versus an 104% increase for the Basque Country and a contraction of 2.8% for Spain.[36] Civil Works and Officially Bid Works also displayed almost 17% and 83% growth respectively in Bizkaia in 2016 versus 2015, contrasting

[30] http://Bizkaia.reuters.com/article/eu-deficit-spain-portugal-idUSL5N17O32J

[31] http://Bizkaia.euskadi.eus/contenidos/informacion/7071/es_2333/adjuntos/Basque_Country_RU_May_13_2016.pdf

[32] Ibid.

[33] S&P Report: "Spain's Autonomous Community of the Basque Country 'A' Rating Affirmed; Outlook Stable". May 13, 2016. P3.

[34] http://Bizkaia.ogasun.ejgv.euskadi.eus/contenidos/informacion/7071/es_2333/adjuntos/CreditOpinionBasqueCountry(24Feb2016).pdf

[35] http://Bizkaia.reuters.com/article/eu-deficit-spain-portugal-idUSL5N17O32J

[36] http://Bizkaia.bizkaia.eus/fitxategiak/05/ogasuna/abagunea/dokumentuak/On%2030%20november%202016.pdf

20% and almost 45% growth for the Basque Country respectively during this Country and a contraction of almost 12% and 8% respectively for Spain.[37] In 2015, Bizkaia experienced a 69.3% increase in Officially Bid Works to €580 million, driven by public works (93%) and construction (17%).[38]

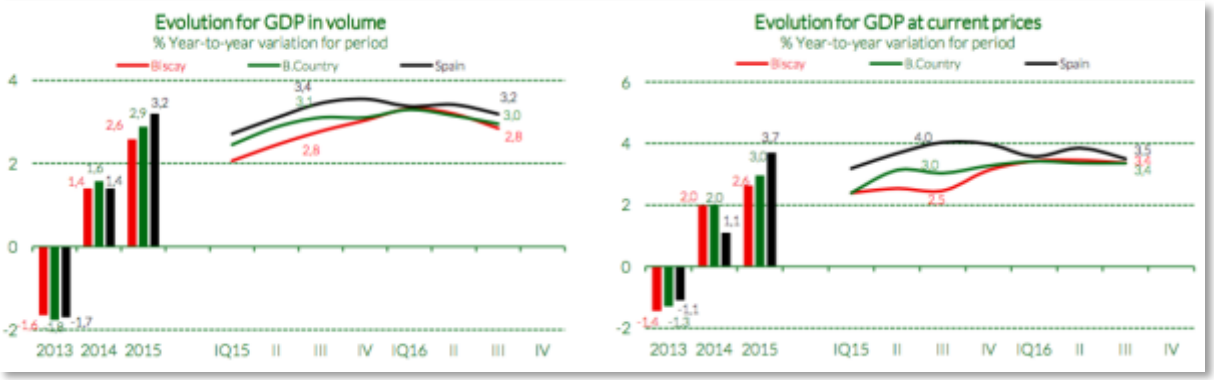

Chart 2: GDP Volume and at Current Prices- Bizkaia vs Basque Country and Spain.
Source: *Bizkaia Foru Aldundia Diputación Foral*[39]

General price stability exists in Bizkaia, with this resulting in relatively minimal movement in the consumer price index (CPI), in line with the Basque Country, where year-end CPI in 2016 was 0.2% lower than the year before and only 3% higher than the index year of 2011.[40] Housing, Medicine, Transport, Leisure and Culture all showed larger decreases over the year, contributing to a stable CPI.[41] The economic performance of Bizkaia and Basque Country compare favourably against Spain, with Bizkaia depicting the strongest growth in 2016 vs 2015 for private sector deposits (3.7% increase) and private sector credits (1.5% increase), with the latter showing a contraction of 2% and 4.7% for the same period for the Basque Country and Spain respectively, as depicted in Table 1.

On 30 november 2016		% Year-to-year variation		
Financing of the Economy	Latest data Biscay	Biscay	Basque C.	Spain
Private Sector Deposits (million euro)	40.976	3,7	3,4	0,5
Private Sector Credits (million euro)	36.279	1,5	-2,0	-4,7
Mortgages (million euro)	163,5	23,3	-1,3	6,6
Created Mercantile Companies	113	13,0	1,0	5,1
Subscribed capital (thousand euro)	1.860	25,0	24,9	31,1
Enlarged Mercantile Companies	42	-4,5	12,3	3,1
Subscribed capital (thousand euro)	32.094	10,0	49,4	-36,7

Table 1: Finance Indicators- Bizkaia vs Basque Country and Spain.
Source: *Bizkaia Foru Aldundia Diputación Foral*[42]

Bizkaia displays the largest increase in created companies (13%), in addition to a high growth in subscribed capital (25%), whilst Spain displayed a 31% increase.[43] For enlarged companies, Bizkaia depicted a small contraction in 2015 of 4.5% versus a growth of 12.1% for the Basque Country and 3.1% growth for Spain: In contrast, subscribed capital displayed a 10% increase in Bizkaia in 2016.

[37] Ibid.
[38] Diputacion Foral de de Bizkaia. Economic and Fiscal Trend in Bizkaia; 2nd Quarter, 2015. Number 67.
[39] http://Bizkaia.bizkaia.eus/fitxategiak/05/ogasuna/abagunea/dokumentuak/On%2030%20november%202016.pdf
[40] http://en.eustat.eus/movil/elementos/ele0000500/ti_Consumer_Price_Index_general_and_by_groups_for_the_State_2007-2016/tbl0000564_i.html#axzz4ZKJ8uZTt
[41] Ibid
[42] Ibid.
[43] Ibid.

This compared with almost a 50% increase for the Basque Country, versus a 36% contraction for Spain during the same time period.[44] The level of debt for families and the private sector decreased marginally in the Basque Country by 2%, and increased marginally in Bizkaia by 1.5%. Bizkaia also displays the largest increase (3.7%) in private sector deposits and the highest increase in mortgages (23.3%), contrasting a 6.6% increase for Spain and a slight fall in the Basque Country (1.6%). The variation in the year-to-year mobile average for loans in Bizkaia also showed the strongest increase in 2016 across these three regions, as depicted in Chart 3.

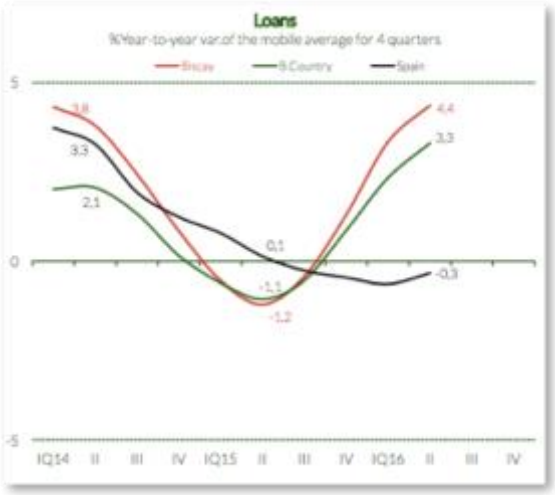

Chart 3: Finance Indicators- Loans. Bizkaia vs Basque Country and Spain.
Source: *Bizkaia Foru Aldundia Diputación Foral*[45]

Bizkaia depicted a 4.4% increase in loans in 2016, reversing a dip observed in 2015 that also occurred for all three Countries. This contrasts a contraction of -0.3% for Spain in 2016 that reflects a continued decrease from 2014, and a 3.3% increase for the Basque Country versus 2015. These result in a positive overall economic climate in Bizkaia, in which firms operate.

Industrial production rose by 0.3% for the Basque Country in 2016 as depicted in Table 2. Bizkaia had the greatest rise in industrial production, with a 4.1% increase. This was followed by Araba/Alava with a 3.5% increase, and a contraction by Gipuzkoa of 5.1 per cent during this period.

	Data corrected for clendar effects	
	Oct2016 / Oct2015	A(Oct2016) / A(Oct2015)(*)
General index		
Basque Country	**0,3**	**1,7**
Araba/Álava	3,5	8,5
Bizkaia	4,1	-0,2
Gipuzkoa	-5,1	0,0

Table 2: Industrial Production in the Basque Country by Province
Source: *Eustat-Euskal Estatistika Erakundea**[46]

[44] Ibid.
[45] Ibid.
[46] Eustat. *Industrial Production Index*, October 2016. Basque Country. *Year-on-year variation rate for the accumulated period from January to the Sept/Oct 2016compared to the same accumulated period for 2015. http://en.eustat.eus/movil/elementos/ele0013700/not0013758_i.html#axzz4ZKJ8uZTt

The increase in Bizkaia was driven by a 4.4% increase in General Manufacturing, an increase of almost 5% in Electricity, Gas, Steam and Air Conditioning, and a small (-0.7%) decrease in the output of Mining and Quarrying, compared to 2015.[47] Some variations of employment continues to occur between these sectors, with available data indicating that around 70,000 people were affiliated with industrial unemployment from a total of around 200,000, resulting in an overall unemployment rate of 12.5% at the end of 2016.[48] Bizkaia reflected an overall unemployment rate at 14% in 2016, compared to 10.9% for Gipuzkoa and 10.8% for Araba/Alava for the same time period.[49] This compares to a national average unemployment rate of almost 18.6% in Spain,[50] and higher rates in some Countries such as Melilla (34.0 %) and Andalucía (31.5 %).[51] All provinces in the Basque Country reduced their unemployment during 2016, with Bizkaia achieving a 2% reduction from 16% at the outset of the year.[52] The number of registered workers have grown by 2.5%-3% in 2016 with this trend forecast to continue in 2017 and unemployment showing a marginal reduction.[53] Unemployment and debt management remain key areas of focus for both the Government of Bizkaia and the Basque Country. Debt remains one of the lowest in Spain with respect to GDP at 13.9%: this is second to Madrid (12.5%) and in contrast to areas such as Valencia (37%) that have the highest debt ratio in Spain.[54] The Basque Country is also amongst a small number of communities that best controlled their debt, with a 6.92% rise in 2015. This contrasts the highest increases observed for areas such as Murcia (22.33%) and Andalusia (17.92%).[55]

Bizkaia has the highest GDP of the three Basque Country provinces at almost €35billion in 2015, representing a 2.6% increase over the year before. [56] This is followed by Gipuzkoa with a GDP of almost €23billion, and Araba/Alava with a GDP of €11.3billion; both provinces display growth of 3.5% and 2.9% respectively for the same period.[57] Table 3 depicts the GDP of the three provinces and the Basque Country.

	Basque Country		ARABA/ALAVA		BIZKAIA		GIPUZKOA	
	Value	Interannual increase	Value	Interannual increase	Value	Interannual increase	Value	Interannual increase
2010	67.595.563		10.666.705		34.704.745		22.224.113	
2011	68.041.740	0,7	11.083.821	3,9	34.680.705	-0,1	22.277.214	0,2
2012	66.775.970	-1,9	10.845.318	-2,2	33.918.944	-2,2	22.011.708	-1,2
2013	65.906.376	-1,3	10.733.011	-1,0	33.427.254	-1,4	21.746.111	-1,2
2014	67.223.820	2,0	10.990.402	2,4	34.091.200	2,0	22.142.218	1,8
2015(a)	**69.216.483**	**3,0**	**11.309.638**	**2,9**	**34.990.148**	**2,6**	**22.916.697**	**3,5**

SEC2010. Base 2010

Table 3: GDP of the Basque Country by Province (thousands of Euros)
Source: *Eustat*[58]. Produced Sept 23, 2016.

[47] http://en.eustat.eus/elementos/ele0000300/tbl0000393_i.asp#axzz4ZKJ8uZTt
[48] http://en.eustat.eus/indice.html#axzz4ZKJ8uZTt
[49] http://en.eustat.eus/movil/elementos/ele0011500/ti_Activity_and_unemployment_rate_of_the_population_aged_16_and_over_in_the_Basque_Country_by_quarter_according_to_province__1_2016IV/tbl0011524_i.html#axzz4ZKJ8uZTt
[50] http://Bizkaia.ine.es/ss/Satellite?c=Page&p=1254735905278&L=1&pagename=INE%2FINELayout&cid=1254735905278#
[51] http://ec.europa.eu/eurostat/statistics-explained/index.php/Unemployment_statistics_at_Regional_level
[52] Ibid.
[53] https://Bizkaia.fitchratings.com/site/pr/1012498
[54] EAE Business School Report. (2015). La Deuda Publica.
[55] Ibid.
[56] http://en.eustat.eus/movil/elementos/ele0012000/ti_GDP_of_the_Basque_Country_by_province_Current_prices_thousands_of_euros_and_variation_rate_2010-2015a/tbl0012037_i.html#axzz4ZKJ8uZTt
[57] Ibid.
[58] Ibid.

The annual GDP yields a high per capita GDP of €30,459 for the Basque Country in 2015,[59] comprised of Bizkaia's per capita GDP of €30,663; €35,115 per capita GDP for Araba/Alava, and €32,272 per capita GDP for Gipuzkoa.[60] The Basque Country and Bizkaia's GDP per capita is 30% higher than the Spanish national average, with this likely to remain at such a level due to the continued stability of the Country's financial structure and negligible CPI changes at present.

The Basque Country enjoyed a trade surplus in 2016 of €3.31 billion, €857 million euros higher than 2015, yielding a coverage rate of total exports over imports of 143.4%, an increase of 14%.[61] Table 4 depicts the trade performance of the Basque Country and the Provinces.

	EXPORTS			IMPORTS		
	April-June			April-June		
	2015	2016	Δ %	2015	2016	Δ %
BASQUE COUNTRY						
TOTAL	**5.814.535**	**5.831.293**	**0,3**	**4.528.892**	**4.099.381**	**-9,5**
ENERGY PRODUCTS	762.021	455.389	-40,2	1.353.649	860.879	-36,4
NON-ENERGY PRODUCTS	5.052.515	5.375.903	6,4	3.175.243	3.238.503	2,0
ARABA / ÁLAVA						
TOTAL	**1.554.000**	**1.792.721**	**15,4**	**843.260**	**973.787**	**15,5**
ENERGY PRODUCTS	3.543	127	-96,4	1.152	538	-53,3
NON-ENERGY PRODUCTS	1.550.457	1.792.594	15,6	842.108	973.249	15,6
BIZKAIA						
TOTAL	**2.485.892**	**2.125.120**	**-14,5**	**2.732.203**	**2.236.284**	**-18,2**
ENERGY PRODUCTS	757.284	453.400	-40,1	1.349.566	859.382	-36,3
NON-ENERGY PRODUCTS	1.728.608	1.671.720	-3,3	1.382.637	1.376.902	-0,4
GIPUZKOA						
TOTAL	**1.774.644**	**1.913.451**	**7,8**	**953.429**	**889.311**	**-6,7**
ENERGY PRODUCTS	1.194	1.862	56,0	2.930	959	-67,3
NON-ENERGY PRODUCTS	1.773.450	1.911.589	7,8	950.499	888.352	-6,5

Table 4: Foreign Trade by Province (thousands of Euros)
Source: *Eustat*[62]

Structural changes have been occurring in the composition of exports across all three provinces since 2008: Metals and Manufactured products have decreased overall from 28% of total exports in 2008 to 21% in 2016, but Transport Materials have increased from 21.6% of total goods exported to 29.5% in 2016.[63] This is reflected in the trade performance of individual provinces: Bizkaia is the only Basque Province to report a reduction in exports in 2016 versus the previous year (14.5%), but the Province also reported the largest reduction in imports (18.2%), yielding a relatively negligible net trade deficit of €111m against an export value of €2.1 billion and an import value of €2.23 billion. Export reduction was driven by a fall in Metals and Manufactured of 19.3% for the Province, and a fall in *Mineral Products* exports by 40.7%. This was offset however by a rise in Plastics & Rubber (11.9%), Transport Material (11.8%) and Electrical Material (8.8%). The reduction in Imports for the Province was driven by the major drop in Mineral Products (-36.4%) and Metals & Manufactured (-9.9%).

[59] Orkestra (2008). Report on Competitiveness in the Basque Country: Towards a Unique Value Proposition, Basque Institute of Competitiveness: Deusto Foundation, Donostia/San Sebastian, Spain.

[60] http://en.eustat.eus/elementos/ele0012000/ti_PIB_per_capita_de_la_CA_de_Euskadi_por_territorio_historico_Precios_corrientes_euros_Bizkaia_tasa_variacion_1980-2015a/tbl0012036_i.html#axzz4ZKJ8uZTt

[61] http://en.eustat.eus/elementos/ele0013600/not0013612_i.pdf

[62] Eustat. Foreign Trade Statistics (Ecomex). II/2016. Press Release 31/08/2016.

[63] Ibid.

Many of the key economic trends for Bizkaia for 2016-2020 remain positive and are likely to continue the current stable fiscal environment in the Province. The major drivers include:

- Positive GDP growth continuing between 2.5%-3.2% for 2016 and 2017;[64]
- Domestic demand will be the primary driver of growth;
- Industry confidence remains moderately positive with regional companies expecting to increase sales in both the domestic and overseas market;[65]
- The utilisation of production capacity is at its highest level since before the recent financial crisis and is forecast to remain there in 2017.[66]

Two factors can impede faster growth in Bizkaia, mirroring those prevalent in Spain and Europe: lower levels of investment and public spending, and with a focus on debt reduction. Lower activity in these areas can facilitate faster economic growth locally.

2.2 Social Factors

Bizkaia has a robust socioeconomic environment that integrates strong commercial and industrial sectors, social 'openness' and comparatively highly skilled human capital.[67] This is facilitated by an Administration with policies that seek to foster a balance between social and economic priorities and to continue developing innovation through competitiveness policies based on clusters, a large network of science and technology parks, and integration between industry and universities.[68] One of the most notable examples of convergence between social and economic development is the existence of cooperatives in the Basque Country. These firm structures are characterised by *community social capital* and contrast commonly found commercial business structures. This type of firm is regulated by specific legislation that seeks to preserve the specialties of the cooperative and to adhere to the body that provides the cooperative's charter: the International Cooperative Alliance (ICA). [69] The ICA provides values and seven principles of voluntary and open membership; democratic member control; member economic participation; autonomy and independence; education, training and information; co-operation amongst co-operatives and concern for community. The Basque Country has a higher percentage of cooperatives than other Countries in Spain,[70] reflecting the prevalence of a number of factors that facilitate this: higher degrees of trust, cooperation and social cohesion.[71]

[64] LSE interviews
[65] http://Bizkaia.confebask.es/coyuntura/2016/economia-vasca-2017/perspectivas-empresariales.html
[66] Ibid.
[67] Totoricaguena, G. P (2004). Identity, Culture, and Politics in the Basque Diaspora. University of Nevada Press.
[68] ftp://ftp.bizkaia.eus/public/Sustapena/Norm98/English/DF5898.PDF
[69] https://Bizkaia.smu.ca/webfiles/IzaskunAlzolaBerriozabalgoitia.doc. Law 4/1993, June 24, Cooperatives of Basque Country. Modified by Law 1/2000, June 29. Law 8/2006, December1. Law 6/2008, June 25. Decree 58/2005, 29 March.
[70] Orkestra (2015). The Basque Country Competitiveness Report.
[71] http://cets.coop/moodle/mod/resource/view.php?id=124

3. Technology and Innovation

3.1 Leading the Way with Technology and Innovation Hubs

Technology and innovation hubs reflect the Basque Government's 'intervention' to develop services and manufacturing since the 1980's. Numerous innovation centres exist across the Basque Country and have assisted in the development of the three major clusters of *aerospace, automotive* and *energy*.[72] Exports have overall continued to exceed production, in some cases by a multiple of over 2:1 (2015 growth exceeded 2014 growth by 5-8% across these clusters),[73] and all the clusters exhibit a high rate of R&D investment (5-10% of turnover) that exceeds the regional and national average, and re-investment rates in R&D that approach 90%, depicting the financial strength of organisations engaged in regional R&D.[74] Figure one indicates that the Basque Country's potential for innovation is twice as high as the European average and greater than Spain's. This is contributed to by over 44% of workers holding higher education degrees, significantly above the EU average of around 26%.[75] Good management practices, encompassing better educated managers, coupled with best-practice technology use result in greater productivity and more profitable firms.[76] This has been confirmed by leading global research on management practices by the LSE since 2005, covering interviews with managers in over 20,000 companies in 35 countries, with a statistically significant correlation between good management practices and better performing companies.[77]

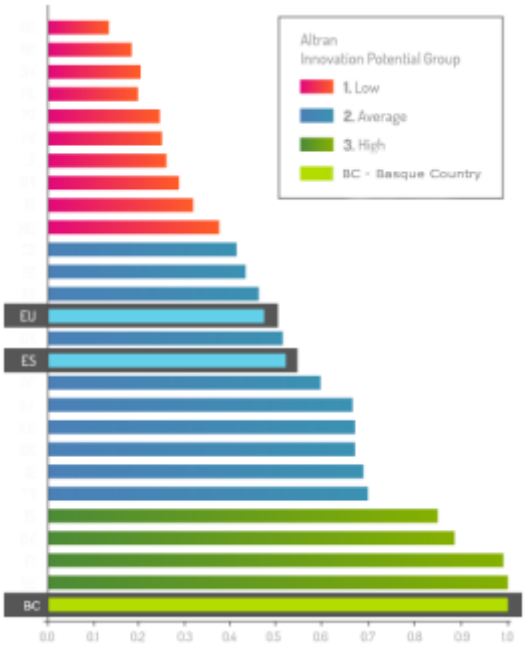

Chart 4: Innovation Index and the Basque Country

3.2 Innovation Benchmarks

An indicator of innovation in Bizkaia is the degree of trade mark activity. This reached 149 trademarks registered in 2016,[78] as depicted in Chart 5. This does not reflect the total trademarks registered however: international, national and local companies operate in the Bizkaia and often, trademarks will be registered by parent companies from their head offices or locations outside of Bizkaia. These are not included within local registration statistics. They are however often a direct result of local innovation, R&D, collaboration, and other trademark-generating activity that occurs within the Province.

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[72] Ibid.
[73] http://Bizkaia.hegan.com/Corporativa/PNoticias.aspx?vTUxxveJgQG13aF3qvgj3mS5EmN5Sbwa
[74] Ibid.
[75] Global Talent Competitiveness Index (GTCI).
[76] Bloom, N., Kretschmer, T., Van Reenen, J. (2011). Are family-friendly workplace practices a valuable firm resource? Strategic Management Journal. Vol: 32(4)' pp: 343– 367.
[77] Bloom et al, (2011). Op cit.
[78] https://knoema.com/ipr_tr_reg/community-trade-mark-ctm-registrations-by-nuts-3-Countries?geo=1010860-gipuzkoa

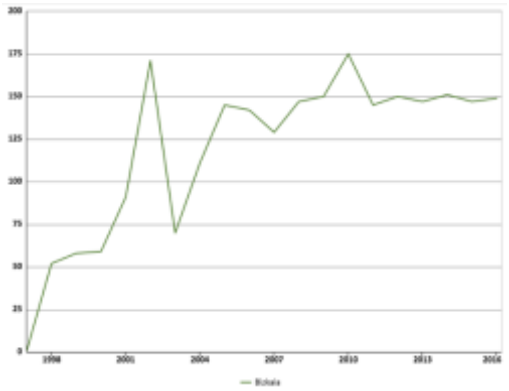


Chart 5: Community trademarks registered in Bizkaia*

A further measure of innovation is patents. The Basque Country filed 199 patent applications in 2015, placing it third in Spain, behind only Catalonia and Madrid, and accounting for 13% of total Spanish patent filings.[79] The Basque Country reflects an 'innovation tradition' versus a 'commercial tradition',[80] with the OECD defining the Basque Country as having the highest innovation intensity in Spain.[81] In 2015, the Basque Country had an average innovation intensity of 1.54%, and 4.22% of companies were engaged in innovation activities as depicted in Table 5.[82] Bizkaia accounted for 46% of the Basque Regions R&D expenditure, the highest of the three Provinces.[83]

	Total		10 or more employees	
	Innovation Intensity(1)	Internal R&D Intensity(2)	Innovation Intensity(1)	Internal R&D Intensity(2)
Total companies				
BASQUE COUNTRY	**1,54**	**0,80**	**2,03**	**1,16**
Province				
Araba / Álava	1,71	0,55	2,17	0,78
Bizkaia	1,43	0,75	1,87	1,08
Gipuzkoa	1,65	1,02	2,26	1,55
Companies with Innovative activities				
BASQUE COUNTRY	**4,22**	**2,20**	**4,17**	**2,38**
Province				
Araba / Álava	5,24	1,68	5,03	1,80
Bizkaia	3,81	2,02	3,70	2,14
Gipuzkoa	4,44	2,75	4,61	3,17
Companies with R&D activities				
BASQUE COUNTRY	**5,45**	**3,62**	**5,25**	**3,49**
Province				
Araba / Álava	5,68	2,23	5,60	2,15
Bizkaia	5,41	3,75	5,21	3,63
Gipuzkoa	5,39	4,21	5,11	4,07

Table 5: Basque Country Innovation and R&D Intensity (2015).
Source: Eustat.[84]

Within the Basque Countries, Bizkaia has the third highest innovation intensity, and the second highest number of companies engaged in innovation. Over 5% of companies in all three provinces

[79] http://Bizkaia.catalannewsagency.com/society-science/item/catalonia-leads-spain-in-patent-applications-surpassing-madrid

[80] Ibid.

[81] OECD (2005). OECD Reviews of Regional Innovation: Basque Country, Spain. As defined by spending on innovation as a proportion of sales.

[82] http://en.eustat.eus/movil/elementos/ele0005500/ti_Intensity_of_innovation_and_internal_RD_in_establishments_in_the_Basque_Country_by_province_and_employment_strata__2014/tbl0005525_i.html#axzz4YlezV4ka

[83] http://Bizkaia.basquecountry.eus/contenidos/informacion/06_revista_euskaletxeak/en_ee/adjuntos/81_14_15_i.pdf

[84] Ibid. (1) Innovation Intensity: (expenditure on innovation/turnover)*100; (2)Internal R&D Intensity: (R&D; expenditure/ turnover)*100. Unit= percentage.

engage in R&D activities including smaller companies. These continue to be strong contributors to innovation, with almost one third of R&D spending coming from this group.[85]

The Basque Country is also characterised by Government commitment to innovation through investment in four technology parks across the Provinces. This represents one of the most intensive regions in Europe for innovation centres, that bring together companies, universities, R&D facilities and technology transfer centres.[86] The technology parks and their profile includes:

Bizkaia Science and Technology Park

- Number of companies: 219
- 7,907 direct employees
- 2 km from the airport, 10km from Bilbao, 6km from the campus of the University of the Basque Country.

Alava technology Park

- Number of companies: 91
- 2,939 direct employees
- 5 km from Vitoria-Gasteiz and the university campus and 7km from Foronda airport, with good access to several European routes.

Gipuzkoa Science and Technology Park

- Number of companies: 92
- 4,080 direct employees
- 5 minutes from San Sebastián city centre and 10 km from the French border.

Garaia Innovation Centre

- Number of companies: 35
- 837 direct employees
- Led by the cooperative Mondragón.

3.3 Administration Support for Innovation

Bizkaia and the other provinces in the Basque Country are the recipients of state-sponsored innovation activities and programmes. The interplay between firms participating in these and commercialising R&D, ultimately contributes to the innovation capability of the Country and commercial success for companies. Political stability is also a contributing factor to spurring innovation:[87] the Basque Country has experienced political stability and policy continuity in successive Basque governments for most of the period since the restoration of democracy in 1978.[88] This has permitted the development of a regional innovation system over almost 40 years that is replete with institutional actors including government, private companies, academic organisations, and other support agencies. Three factors distinguish the Basque regional innovation system from the rest of Spain and many other countries: (1) The Department of Industry plays a pivotal role in promoting applied research through a network of technology centres that are considered to be a cornerstone of the Country's innovation policy; (2) universities have played a smaller role; (3) an

[85] http://Bizkaia.basquecountry.eus/contenidos/informacion/06_revista_euskaletxeak/en_ee/adjuntos/81_14_15_i.pdf
[86] 2016. *Euskadi Basque Country.* Estatistika Organos.
[87] Westley, F and Antadze, N. (2010). Making a Difference: Strategies for Scaling Social Innovation for Greater Impact. Innovation Journal. Vol. 15(2); pp: 1-19.
[88] Morgan, K. (2013). Op cit.

applied research focus has been the aim, versus basic research, resulting in technology transfer as opposed to knowledge generation.[89]

Two major areas of activity reflect the Administration's focus in Bizkaia on innovation: the diversification of existing technology in *Energy* and establishing new capability in *bio-science*. These are examples of government impetus to stimulate a regional innovation system with knowledge *creation* versus knowledge *transfer*. This innovation focus is reflected by companies spending 58% of their R&D within the Country, but obtaining only 35% of revenue from within it.[90] This indicates higher value-added and innovation activities being concentrated in the Basque Country.

The Government's 3E2030 Energy Strategy seeks to continue fostering investment and collaboration, with one of its seven key objectives being; *"Improve the competitiveness of the network of companies, technology centres and Basque scientific agents, promoting 9 priority areas for research, technological and industrial development in the energy field, in line with the RIS3 strategy for smart specialisation in the Basque Country."*[91] The government is committing investment to facilitate this: "*Achieving the proposed energy targets will require an overall investment across all sectors of €4,930M during the period 2016-2030. Looking at individual areas, the investments to be made in energy efficiency (45%) and renewable energy (50%) stand out. The investment of the Basque Administration will be €920M*." Regional energy policy is an example of local innovation 'in action' through the Basque Energy Agency (EVE), that manages new projects including transport electrification, smart grids, and renewable energy. A distinctive feature of the Basque Government's energy strategy is its engagement in every stage from providing funding for research (undertaken by *the EnegiGune CIC*) to the commercialisation process that includes joint ventures with private companies to investigate the opportunities for new products and services.[92] This engagement strategy is reflected in the execution of two major energy projects: transport electrification and smart grids.

In addition, the Government of Bizkaia has achieved success with its bioscience initiative *CIC bioGune* (Centre for Cooperative Research in Biosciences), opened in the Technology Park of Bizkaia in 2005 with a €35 million investment.[93] CIC bioGUNE currently employs over 150 people, including 20 research group leaders, 100 postdoctoral researchers, technicians and engineers, and providing training opportunities to more than twenty PhD students each year. Additional funding has been received from Spain, international institutions, the Basque Government and the regional Government of Bizkaia that has contributed 12.4% of it funding since inception, resulting in over 100 scientific publications being published in peer-reviewed journals in 2015 and the licensing of two patents.[94]

In February 2015, the European Commission approved the European Regional Development Fund (ERDF) operational programme 2014-2020 for the Basque Country with co-funding from the (ERDF).

[89] Ibid.
[90] Morgan, K. (2013). The regional state in the era of Smart Specialisation. EKONOMIAZ. Revista vasca de Economía; Vol. 83(2); pp: 103-126.
[91] http://Bizkaia.eve.eus/Planificacion-energetica-e-infraestructuras/Estrategia-E2020.aspx?lang=en-GB
[92] Morgan, K. (2013). Op cit.
[93] http://Bizkaia.cicbiogune.es/center/about
[94] Ibid.

The programme seeks to drive sustainable economic growth in the Basque Country through employment creation, particularly in high added value sectors, and improve the competitiveness of the regional economy focused on six main priorities:[95]

- To strengthen research, technology development and innovation (44.6% of funding).
- To drive the change towards a low-carbon economy in all sectors (25.9%).
- To improve access, use and quality of the information and communication technologies (10.5%).
- To enhance the competitiveness of the SMEs (8.7%).
- To foster the adaptation to climate change and risk prevention and management (5.4%).
- To conserve and protect the environment and foster the efficient use of resources (4.5%).

The Programme is forecast to generate the following results:

- €452.6 million of private investment.
- Support for over 50,000 SMEs to make them more competitive.
- Use of electronic administrative services by over 75% of companies.
- Production of over 100 MW energy using renewable energy sources.
- Over 6,000 households benefitting from a better classification in their electricity consumption.
- Nearly 2,500 people benefitting from flood-protection measures.

The Programme's cost is €353 million with half being funded from the ERDF. The Programme will cascade the funding to community funds approved by the Basque Government to target a number of goals:[96]

1. Encourage R&D.
2. Better use and quality of ICT, and improved access.
3. Increase SMEs' competitiveness.
4. Providing a boost to the low-carbon economy.
5. Risk prevention and management.
6. Conserve and protect the environment and promote efficient use of resources.
7. Technical assistance.

The Diputación foral de Bizkaia will also invest €53.7 million of the funds in the Province as part of its 2014-2020 plan. Table 6 summarises the Diputación's projects segmented by project goal, spending category, and the funding split with the ERDF.[97]

Thematic Goal	Investment Priority	Spending category	Project	Investment €	ERDF €
1. Encourage R&D	**1.1.** Improve R&D infrastructures, develop excellence in R&D and promote centres of excellence, above all	**O.E.1.1.2.** Strengthen R&D institutions, create, consolidate and improve scientific and technological infrastructures.	Development and/or equipment infrastructures	6.570.000	3.285.000

[95] http://Bizkaia.bizkaia.eus/home2/Temas/DetalleTema.asp?Tem_Codigo=10331&idioma=IN&dpto_biz=1&codpath_biz=1%7C7780%7C7934%7C7786%7C9206%7C9217%7C10331

[96] Ibid

[97] Ibid

Thematic Goal	Investment Priority	Spending category	Project	Investment €	ERDF €
	projects of European interest.				
	1.2. Encourage investment from companies engaged in innovation and research, develop links and interaction between businesses, research and development centres, and the higher education sector, particularly investment in product and service development, technology transfer, social and ecological innovation, public service applications, stimulating demand, network connectivity, open innovation and clusters through smart specialisation and support for technological and applied innovation, pilot lines, early product validation actions, advanced production facilities and initial production, particularly in key enabling technologies and promoting general purpose technologies.	**O.E.1.2.1.** Develop and promote R&D activities led by businesses, and support the creation and consolidation of innovative businesses.	Support research and innovation in Bizkaia	22.934.310	11.467.155
3. Increase SMEs' competitiveness.	**3.1.** Promote entrepreneurial spirit, especially making it easier to monetise new ideas, and boosting the creation of new businesses and business incubators.	**O.E.3.1.2.** Creation of new businesses and business incubators, in particular improve access to funding and advanced support services. We suggest developing specific activities to support the generation and promotion of an entrepreneurial spirit and the creation of new businesses.	Support services for entrepreneurs	1.365.000	682.500
	3.3. Support for the creation and expansion of advanced skills for the development of SMEs' products and services.	**O.E.3.3.1.** Support for the creation and expansion of advanced skills for the development of products and services. We suggest supporting Basque SMEs to drive competitiveness, regardless of their sphere of	Drive the implementation of technology and connectivity in businesses	1.890.000	945.000

Thematic Goal	Investment Priority	Spending category	Project	Investment €	ERDF €
		activity, through knowledge and skills related to different factors in competitiveness: management, marketing, design, creativity, etc.	in Bizkaia		
			Promote the awareness and development of creative businesses in Bizkaia	1.260.000	630.000
4. Give a boost to the low-carbon economy in all sectors.	**4.5.** Promote strategies to reduce carbon consumption in all geographical areas, above all urban areas, promoting (among other things) sustainable multi-modal urban mobility, and mitigation and adaptation measures.	**O.E.4.5.1.** Promotion of sustainable urban mobility, improvements in road networks, cycle networks, pedestrian routes, electric mobility and development of clean energy supply systems.	Responsible mobility: intermodality and sustainable alternatives	19.368.070	9.819.035

Table 6: The Diputación foral de Bizkaia's 2014-2020 operational plan and funding segmentation[98]

3.4 Social Innovation

The Basque Government has established multiple innovation-fostering initiatives across the Provinces, including Vocational Training (FP) as part of Europe 2020 Strategy, and the Basque Vocational Education and Training (VET). The VET seeks to offer innovation services to SMEs through the provision of teachers and equipment VET centres in its *TKgune* programme, which in 2015/2016 offered 354 services to 252 companies in the Basque Country, with organisations paying for these.[99] In addition, the Government of Bizkaia has secured 50% EU funding for a €2 million project to promote the development of a competitive social market economy to enhance the opportunities offered by innovative social companies or enterprises through the creation of new social companies or enterprises that can act as a key instrument for ensuring the creation of wealth and employment.[100] Throughout the duration of the project the Government is targeting 40 socially innovative projects to be supported, with least 10 culminating in the creation of a new enterprise. The Government is targeting the generation of 32 new jobs, divided between men and women equally as an aim.[101]

Social development has been further boosted through €8 million invested to date for recruiting, and training 145 high-skilled professionals in 60 companies in Bizkaia active in innovative sectors such as the biosciences, climate change, biophysics, new materials and their applications, the automotive industry, and social innovation. This financial support is targeted at firms, universities, associations

[98] Ibid

[99] https://blog.uiin.org/2016/11/tkgune-programme-facilitating-innovation-basque-country/

[100] http://Bizkaia.bizkaia.eus/home2/Temas/DetalleTema.asp?Tem_Codigo=10228&idioma=IN&dpto_biz=5&codpath_biz=5|384

[101] Ibid.

and foundations with a registered office in Bizkaia or that have a centre of work there.[102] This investment complements a significantly mature education infrastructure in the Basque Country: four universities service the Country with over 90,000 students enrolled and 4,000 academics. These universities provide a strong feeder into local industry with a particular emphasis on technical-related degrees with the highest student enrollment in Industrial Engineering, with this taught for over a century.[103] The Bilbao and San Sebastian Schools of Engineering are among the most highly accredited in Spain, with a history that dates back more than a century in the case of the Bilbao School.

The Government of Bizkaia is active in promoting grass-roots innovation through *Seed Capital de Bizkaia*- a Regional Council company affiliated with the Bizkaia Regional Council's Department of Economic Development and Innovation. The aim of this area is to promote and develop new and existing companies and new products; markets or production processes; improved management, stability or continuity; a vision for the future, and the creation of stable jobs and the generation of wealth to support the creation, growth and consolidation of new innovative companies as well as business initiatives deemed to be socially innovative.[104] Three types of funds are offered:

- *Seed*: Promote and encourage to take part in the shareholding of companies of new creation.
- *Development*: Promote and develop new and existing companies' new products, markets or production processes.
- *Social Innovation*: Support the creation, growth and consolidation of new innovative companies as well as any business initiatives deemed to be socially innovative.

Various conditions are attached to funds with amounts for seed capital available varying from €60,000-€300,000 Euros; up to €300,000 for loans; 95% of project cost up to €25,000. The Government also offers a fund *Seed Capital de Bizkaia, Fondo de Capital Riesgo*. This is open to any investor (public and private) wishing to invest to promote and develop local companies.[105]

[102] https://Bizkaia.bizkaiatalent.eus/en/adjudicacionayudas/
[103] SPRI. The Basque Automotive Suppliers Industry
[104] http://Bizkaia.bizkaia.eus/home2/Temas/DetalleTema.asp?Tem_Codigo=6904&idioma=IN&dpto_biz=8&codpath_biz=8%7C6889%7C6904
[105] Ibid.

4. Introducing Basque Automotive, Energy and Aerospace Clusters

4.1 Clusters: A Definition

"Business clusters and 'clustering can be understood as new and advanced forms of business organisation and networking. Moreover, the creation of clusters is regarded as market driven. They form because SMEs want to strengthen their competitiveness through cooperation strategies."

EU Observatory of European SMEs, Report 2002/No. 3

Clustering is the 'de-territorialisation of closeness'.[106] The European Union's *SME Observatory* defines industrial districts of firms, whether physical or virtual, as 'new forms of business organisation'.[107] No harmonised theory of clusters exists however, with the concept often drawing criticism of 'eclecticism'.[108] Michael Porter's definition of clusters is arguably the most widely utilised: "Geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries, and associated institution in particular fields that compete but also co-operate" (1998, p197).[109] This reflects the agglomeration of firms (a 'cluster') linked by input-output exchanges on the basis of their production complementarities in particular.[110] Knowledge is regarded as the core driver of economic growth in the knowledge economy age, representing an 'internal growth mechanism'.[111] In this climate, a dependence on knowledge or the collection and utilisation of information highlight the requirement for effective technology utilisation and specialised human resources.

The capacity to generate and utilise knowledge and the effectiveness of the generation and utilisation of this knowledge have become critical to supporting industrial clustering and consistent economic development.[112] These attributes are represented in Bizkaia, with a key aim of its Administration being to integrate knowledge, technology and industrial development, and to stimulate a regional innovation system with knowledge *creation* versus knowledge *transfer*. This has led to the establishment of a number of successful international-focused clusters in Bizkaia and the surrounding provinces, in automotive, energy and aerospace. An overview of these clusters from the Basque Country is presented in the following sections, with Bizkaia firms included where information is available, including leading market firms such as Mondragon. A focus on Bizkaia follows, in the assessment of management practices of 10 firms located in this Province from across the three clusters.

4.2 Automotive Cluster

The automotive cluster is one of three major clusters in the Basque Country, with production present in the Provinces including Bizkaia. It is the longest established automotive cluster in Europe

[106] Bunnell, T. and Coe, N. (2001). Spaces and scales of innovation, Progress in Human Geography. Vol 25: pp569-589.
[107] EU Observatory of European SMEs, Report 2002/No. 3
[108] Desrochers, P., Sautet, F. (2004). Cluster-Based Economic Strategy, Facilitation Policy and the Market Process. The Review of Austrian Economics. Volume 17(2/3); pp: 233–245.
[109] Porter, M.E. (1998). Clusters and the New Economics of Competition. Harvard Business Review; Boston; Nov/Dec, p197.
[110] Enright, M. (2001). Regional Clusters: What We Know and What We Should Know. Paper presented at the Kiel Institute International Workshop on Innovation Clusters and Interregional Competition. 12-13 November.
[111] Hu T, Lin C, Chang, S. Role of Interaction between Technological Communities and Industrial Clustering in Innovative Activity: The Case of Hsinchu District, Taiwan. Urban Studies. Vol (42)7; pp: 1139– 1160.
[112] Ibid.

and is one of most significant clusters in the Basque Country's economy, contributing to Spain being the second largest producer of vehicles in Europe, and 8th in the world.[113] The Basque Country's automotive cluster includes leading global players such as *Mondragon*, with companies in Bizkaia and one of the world's largest co-operatives. The Company employs over 80,000 people globally including 35,000 working outside Spain, mainly in emerging markets.[114] The cluster comprises over 300 suppliers with a global turnover of €15 billion in 2015, and €16.5 billion in 2016,[115] accounting for 22% of the Country's GDP and €470 million spend in R&D.[116] Basque manufacturing accounts for more than 45% of the production volume of Spain's car industry has a broad manufacturing base, with companies in Bizkaia and other Provinces producing a wide range of products, including engines, shock absorbers, brakes, gear boxes, steering components, vehicle interiors and exteriors for major carmakers and tier one suppliers globally. These operations further contribute to local employment, GDP and innovation through their integration with suppliers locally such as steelmakers, die makers, machine tool manufacturers, technology centres, engineering and consultancy firms and others. Chart 6 depicts the continued growth of the cluster, with a 271% increase in turnover occurring over a 20-year period, to 2015.

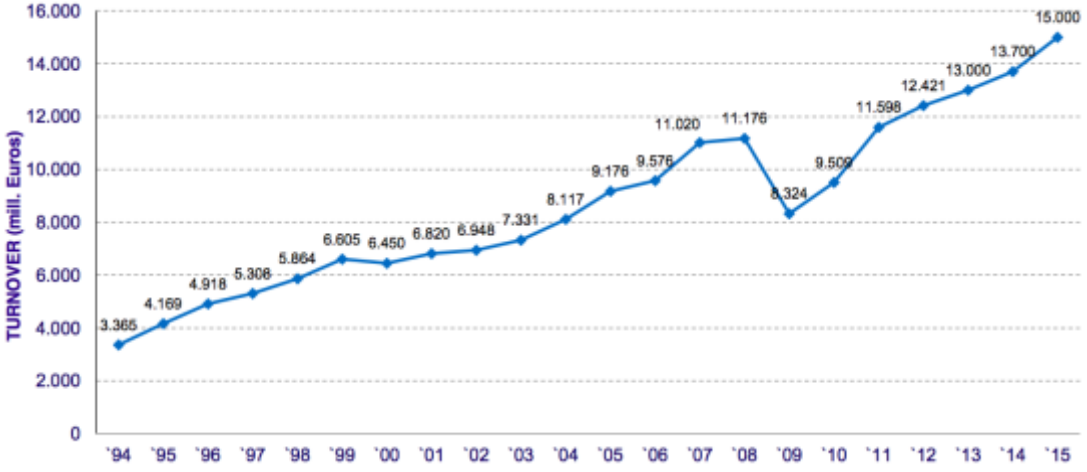


Chart 6: Basque automotive cluster turnover
Source: ACICAE data

A significant feature of the automotive cluster in Bizkaia that reflects the Government's applied innovation focus, is the Automotive Intelligence Centre (AIC). This is a European open-innovation centre providing value-adding for the automotive industry through the integration of knowledge, technology and industrial development.[117] The AIC promotes cooperation between OEM's and Tier One firms to promote innovation, productivity and efficiency, including: reducing time to market; minimising effort and risks; targeting strategic areas for the automotive cluster such as safety, sustainability; new materials design and manufacturing, and advanced in car entertainment systems and others.

[113] http://Bizkaia.exteriores.gob.es/Portal/es/SalaDePrensa/Multimedia/Publicaciones/Documents/2014_FOLLETO%20ESPANA%20PAIS%20DE%20TECONOLOGIA%20ENG.pdf
[114] http://www.mapagroup.net/tag/mondragon/
[115] AIC Data.
[116] https://Bizkaia.bizkaiatalent.eus/en/pais-vasco-te-espera/apuesta-de-futuro/automocion-estrategico-economia/
[117] http://Bizkaia.aicenter.eu/ing/definicion.aspx

Bizkaia and other provinces are home to a range of automotive manufacturers and other companies in the automotive cluster: this is in contrast to some countries where a single-brand factory dominates local production. Bizkaia and the Basque Country are the headquarters of major players such as the cooperative *Mondragon Automocion*, *CIE Automotive* and others including a leading supplier of auto parts, *Gestamp*. These areas have over 30 foreign automotive multinationals that have been located in Bizkaia and the Basque Country for a number of decades, complemented by the majority of the cluster that is populated by SMEs that are highly specialised in technologies, processes, or products, and have developed strong partnerships with international customers. Bizkaia and other Provinces reflect a global automotive cluster with 90% of revenues originating from international projects.[118] Basque automotive suppliers also have more than 700 factories worldwide, 270 of them outside Spain in countries like the Czech Republic, Slovakia, Poland, Rumania, Brazil, Mexico, China and India.[119] Over half of the automotive companies in the Basque Country are original equipment manufacturers (OEM's), with 46% Tier 1 and a small proportion aftermarket firms.[120]

The growth in the Basque Country's automotive cluster reflects an evolving destination mix. In particular, sales have been reducing to Spain, the Basque Country and the EU, and growing to the rest of the world in a larger proportion. Chart 7 depicts the sales growth of the Country.

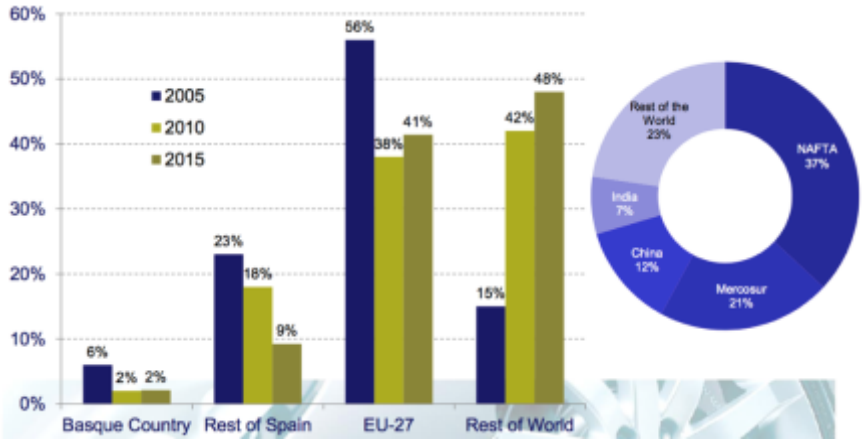


Chart 7: Basque automotive sales growth by destination
Source: ACICAE data

Revenue from the rest of the world grew from 15% of sales in 2005 to almost half by 2015. Interviews highlight two key drivers for this growth: (1) a greater proportion of international companies have located in the Basque Country and utilised the area as a springboard for further international expansion; (2) local companies have successfully expanded internationally. The Basque Country offers a strategic 'jumping point' to multiple export destinations in Southern Europe, Latin America, Asia, and beyond. The Country is located in the north-eastern corner of the Iberian Peninsula, one of the largest industrial areas in Spain and along the Atlantic seaboard in Europe. Bizkaia and the other Basque Provinces are strategically positioned the Basque Country amongst a network of seaports, national and international airports, well connected modern motorways and roads, and a developed rail network. The key logistical hubs of the Port of Bilbao and Vitoria Airport

[118] http://Bizkaia.spri.eus/en/invest-in-the-basque-country/significant_sectors/automotive_sector
[119] Ibid.
[120] Ibid.

provide access for goods to and from major international destinations. Bizkaia and other Basque Provinces have a long history of international activity, including exporting, owned-facilities and strategic alliances in many countries including within the EU, Latin America, Asia and the Far East. Language advantage in Latin America provides a readily accessible market culturally and logistically. The majority of automotive companies in this cluster in the Basque Country are local companies, employing 51-500 people as depicted in Chart 10. One third are Basque Multinationals employing 251-500 people, with the remaining 15% being Multinationals employing more than 500 people. The majority local employment and production is undertaken by small mid-sized companies.

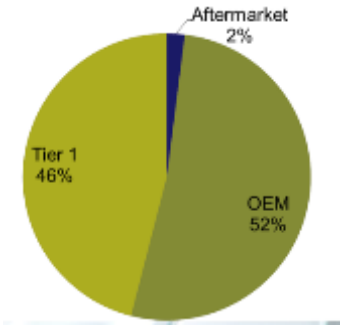


Chart 9: Basque automotive type

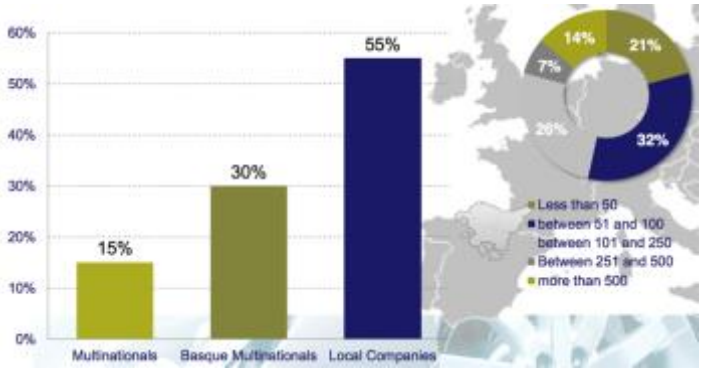


Chart 10: Basque automotive company by company size

The automotive companies located in Bizkaia and the Basque Country have a global plant presence, with production plants in multiple countries. Chart 11 depicts the countries these firms operate in, with a mix of local plant presence and international companies operating in the Basque Country and others countries. Western Europe, Eastern Europe and Asia represent the major countries of activity (20% and over), with NAFTA, S. America representing the next major block (15%) and other countries reflecting a smaller presence. The Basque Country represents an additional expansion point for both international and local automotive companies for the markets depicted in Chart 11. Interviews with companies in Bizkaia indicate that the Province is an internationalisation for a number of reasons: (1) experience exits in existing companies in exporting to these countries; (2) operations have been established in Bizkaia and in many of these exported countries since the 1990's; (3) In some countries such as S. America, language and cultural similarities permit advantages; (4) infrastructure in the Basque Country including airports, ports, road and major logistical transporters, facilitate rapid exporting and competitive logistical options.

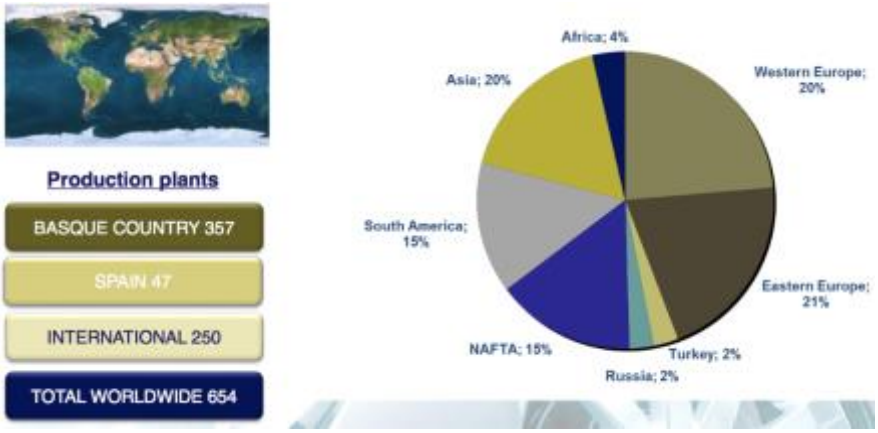


Chart 11: Basque automotive cluster international footprint

Automotive production in the Basque Country is dominated by car production that accounts for around 68% of total production. This is followed by light commercial vehicles production (13%) and light industrial vehicle production (8.6%). Chart 12 depicts automotive production by vehicle type.

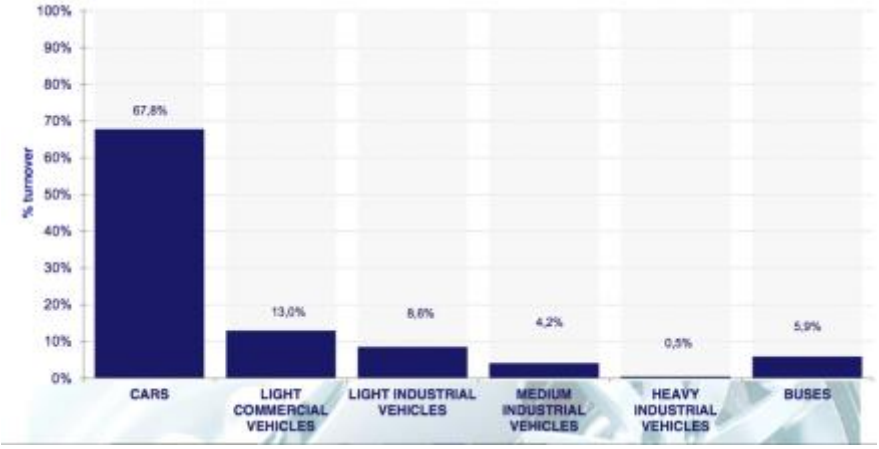


Chart 12: Basque automotive production by vehicle type
Source: ACICAE data

The remaining 10% of production is segmented between medium industrial vehicles (4.2%), busses (5.9%) and heavy industrial vehicles (0.5%). Production reflects the dominance of car production in the Country. The profile of sales from the Basque automotive cluster is depicted in Chart 13. This reflects that Assembly (17%) is the predominant activity, followed by machining and precision parts (15%), casting (10%) and other processes (11%). Welding and press-forming account for 9% of sales each, followed by a number of processes occurring below this figure.

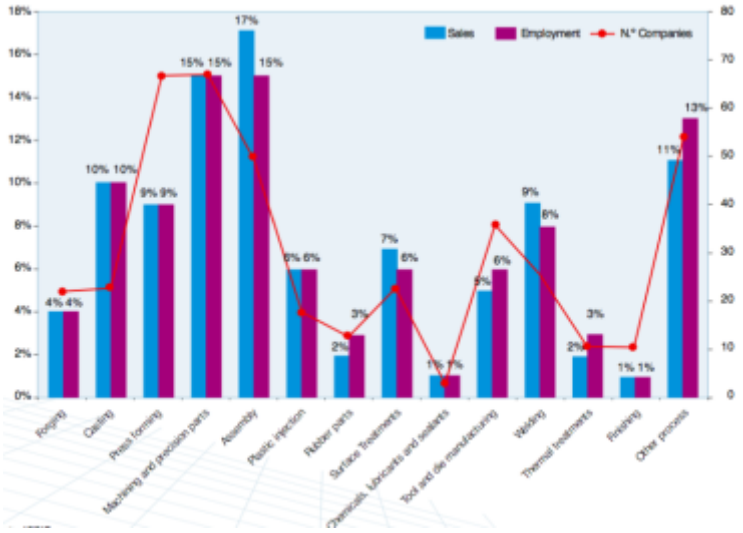


Chart 13: Basque automotive production by manufacturing process
Source: ACICAE and SPRI data

Basque automotive companies are engaged in the production of multiple products for customers. The Country displays strength in the breadth of products offered, and the specialisation in a number of products. Thirty-six percent of companies manufactured steering transmission components, followed by suspension systems (35%) and engine parts (33%). In addition, between 23-24% of companies produced body systems, gear boxes and systems and brake systems. Chart 14 depicts the distribution of these and other products manufactured.

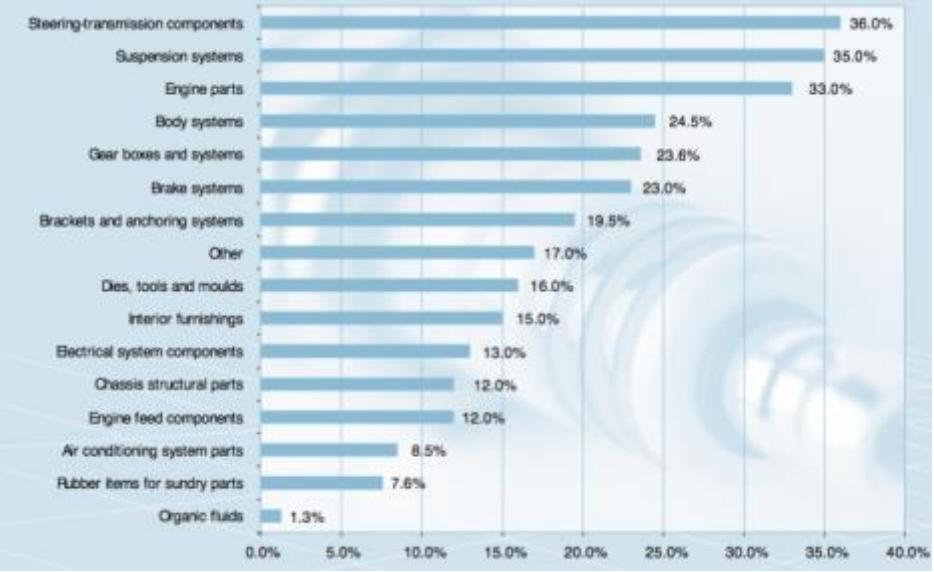
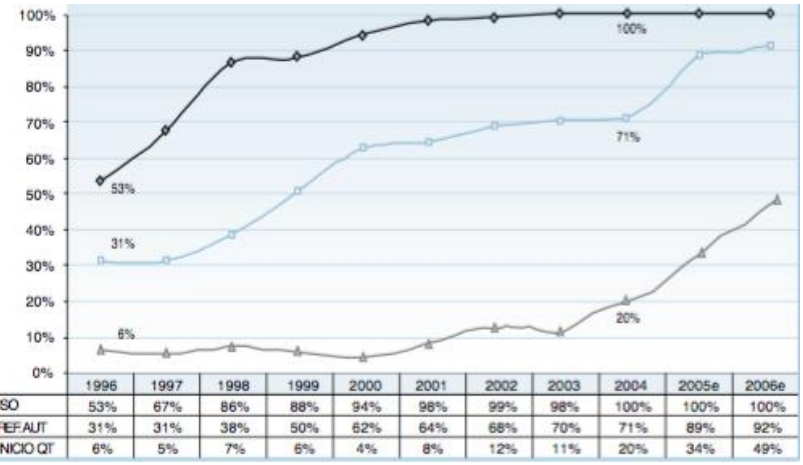


Chart 14 Basque automotive products
Source: ACICAE

A continued focus amongst automotive companies interviewed in Bizkaia is on *improving quality*. This was undertaken by all companies reviewed and confirmed by others in the AIC and industry bodies. A continuous quality improvement is a key reflection of cluster strength and was being driven by a number of factors: (1) customer mandate for best-practices in production; (2) cost reductions over time; (3) contract requirements with customers stipulating quality standards for OEM's. Chart 15 depicts the evolution of quality amongst Basque automotive companies for three key indicators:

- ISO: Companies certified to ISO9000 or other automotive standard.
- REF. AUT: Companies certified to all or some of the key automotive standards: QS9000, VDA EAQF, ISOTS16949.
- INTRO QT: Companies using Total Quality and/or EFQM self-assessment methodologies



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005e	2006e
ISO	53%	67%	86%	88%	94%	98%	99%	98%	100%	100%	100%
REF.AUT	31%	31%	38%	50%	62%	64%	68%	70%	71%	89%	92%
INICIO QT	6%	5%	7%	6%	4%	8%	12%	11%	20%	34%	49%

Chart 15: The AIC and the Basque automotive ecosystem
Source: ACICAE

The overriding trend over time has been an improvement in quality across the three indicators, with all companies obtaining ISO accreditation.

A unique feature of the automotive cluster in Bizkaia is the collaborative innovation approach fostered by the Administration and adopted by many organisations. This is reflected by the AIC Automotive Intelligence Centre, conceived as a European open-innovation facility. The mission of the AIC is; *"A unique value-generation centre for the automotive cluster based on a concept of open innovation in which companies improve their competitiveness through cooperation. Using a market-oriented approach, AIC integrates knowledge, technology and industrial development under one umbrella.*[121]*"* It provides high added value for the automotive industry at a global level through the integration of knowledge, technology and industrial development. AIC was created to promote value-added cooperation projects that are aimed at OEM's and Tier One firms to develop innovative practices and reduce time-to-market that reduce effort, risk, and also focus on strategic areas for the automotive cluster such as safety, sustainable mobility, new materials/design/ manufacturing, advanced ICE Systems and others. Figure 1 depicts the Basque automotive cluster and the embedded role of the AIC. The AIC has 30 member companies located on-site that have established their training, R&D and industrial development units the Facility. They work independently but in a collaborative manner to define projects with a common interest.

Figure 1: Basque automotive cluster
Source: ACICAE

The automotive cluster in Bizkaia and the Basque Country has improved in a number of key areas including quality, revenue, employment, internationalisation, and R&D spend.[122] In addition, the major trends observed in the cluster over the past two decades include:[123]

- Reduction of decision centres
- Increased purchasing volumes
- Increase in the number of Customer production plants
- Increase in the average size of companies
- A transfer of non-strategic skills
- Reduction of new product launch times
- Sophistication of customer requirements across key categories: *leisure, safety, comfort*
- Incorporation of innovation and new technology for electronics, communications and materials
- The total cost of output continuing to be reduced during product lifetime

Combined with strong collaborative support from the Administration in Bizkaia, the automotive cluster in Bizkaia displays strong attributes defined and refined since the 1980's, and supported by a strategic location with accessible infrastructure, road, rail, and sea links. These result in a cluster that contributes to local GDP, employment, and the use of higher skills sourced locally for many areas.

[121] http://Bizkaia.aicenter.eu/ing/definicion.aspx
[122] ACICAE and SPRI Data.
[123] Ibid.

4.3 Aerospace Cluster

The Basque aerospace cluster is a significant contributor to the local economy: the 47 member companies of the Basque Aeronautics and Space Cluster Association (*HEGAN*) had revenue of €1.93 billion in 2015 globally, a growth of more than 10% on the turnover of 2014.[124] Exports for these companies was €1.3 billion, an increase of 7.6% to 2014, and they accounted for 12,440 jobs worldwide.[125] The Basque Country assisted Spain to be fifth largest Aerospace sector in Europe, with Spanish turnover of €9.7 billion in 2015 and employing 54,000 people.[126] The industry exports 84% of its production, and contributes 5.8% to the Spanish industrial GDP. It has grown in turnover by 3.2% annually since 2015, and has doubled in size since 2006.[127] Chart 15 depicts the growth of the Spanish aerospace sector, assisted by the Basque Country.

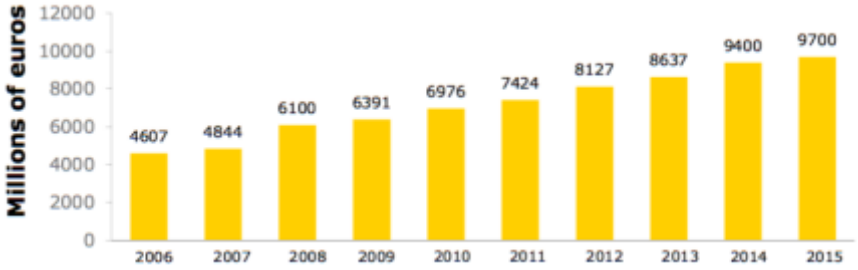


Chart 15: Revenue for the Spanish aerospace market
Source: TEDAE and ICEX[128]

The Basque Country comprises 9.9% of Spain's aerospace sector in turnover and 10.6% in terms of its employment.[129] Madrid and Andalusia account for a higher proportion of turnover (72% combined), whilst Castilla-La Mancha and Catalonio account for less (13% combined).[130] In addition, Hegan members accounted for 18.9% of the Spanish aerospace turnover, and 1% of European aerospace turnover.[131] Table 7 summarises the Basque Country's contribution to the indicators from the members of the aerospace cluster (HEGAN) of the Country, including global turnover.

DATA	2015	2014	VARIATION 2014
TOTAL TURNOVER (€M)	1,935	1,755	10.3 %
TURNOVER BASQUE COUNTRY	897	874	2.7 %
EXPORTS (€M)	1,226	1,139	7.6 %
R&D INVESTMENT (€M)	162	165	-1.8 %
TOTAL EMPLOYMENT	12,437	12,546	-0.8 %
EMPLOYMENT BASQUE COUNTRY	4,225	4,278	-1.2 %

Table 7: HEGAN cluster member indicators and Basque Country contribution
Source: HEGAN data[132]

[124] http://Bizkaia.hegan.com/Corporativa/PNoticias.aspx?vTUxxveJgQG13aF3qvgj3mS5EmN5Sbwa
[125] Ibid.
[126] 2016. ICEX. Invest in Spain. Spain: Business Opportunities in Aerospace.
[127] Ibid.
[128] TEDAE, Spanish Association of Technological Companies of Defense, Aeronautics, Security and Space
[129] Ibid.
[130] Ibid.
[131] Hegan, Eustat, Tedae data. Consolidated in *Hegan Basque Aerospace Cluster: History and Drivers , January 2017.*
[132] http://Bizkaia.hegan.com/Corporativa/PNoticias.aspx?vTUxxveJgQG13aF3qvgj3mS5EmN5Sbwa

The Basque aerospace cluster contributed 1.3% of the Country's GDP, 6.1% of its industrial GDP, and 2.2% of its employment.[133] It also accounted for 18.9% of Spanish aerospace turnover and 1% of European aerospace turnover; 24.2% of Spanish aerospace employment and 1.8% of European aerospace employment; 18.9% of Spanish aerospace R&D and 1% of European aerospace R&D.[134] Table 8 consolidates Hegan cluster member revenue globally across the three key provinces of the Basque Country, Spain and the rest of the world.

2015 Geographical breakdown	Turnover (M€)	Δ 2014	Employment	Δ 2014
Basque Country	897	2.7%	4,225	-1.2%
Rest of Spain	861	23.5%	6,409	1.9%
Rest of the World	177	-3.6%	1,806	- 8.8%
TOTAL	1,935	10.3%	12,440	-0.8%

Table 8: HEGAN cluster member revenue by Basque Country, Spain and Rest of the World
Source: HEGAN data

The major overseas markets included brazil, China, France, Germany, India, Malta, Mexico, Poland, Portugal, Romania, UK and the US.

R&D and employment reflected marginal changes, with overall status relatively unchanged in 2015. Turnover from the Basque country increased by 2.7% to €897 million in 2015, with employment marginally lower at 4,225 people in 2015. R&D investment from Hegan members in 2015 was €163 million, but over the last 10 years, these companies made a total investment in R&D of €1.43 billion, with 88% of this self-financed: this represents a reinvestment of 8.4% of turnover.[135] This represents a total of 10.5% of people (1,294) engaged in R&D activities. Table 9 summarises Basque cluster member R&D and exports.

2015	M€	% over Sales	Average % over Sales since 1993
MEMBERS R&D INVESTMENT	163	8.4%	15.5%
MEMBERS EXPORTS	1,226	63.4%	69.7%

Table 9: HEGAN cluster member R&D and exports
Source: HEGAN data

The global revenue of Hegan's members grew by 10.3% in 2015 across 141 production centres internationally to reach €1.93 billion in 2015, with exports accounting for 65% of this revenue (€1.22 billion), and exceeding one billion Euros for the third consecutive year. The main destination of Basque aerospace exports is Germany (€300 million), followed by the United Kingdom (€291 million) and the United States (€198 million).[136] The key areas contributing to Hegan member revenue were: Aerostructures, €1,029 million (53.2%); Engines, €763 million (39.4%); Systems and Equipment, €97 million (5%); and Space, €46 million (2.4%).

Basque aerospace companies display a broad degree of expertise and production, with manufacturing undertaken for many major Primes and other customers. The primary expertise of

[133] Ibid.
[134] Hegan, Eustat, Tedae data. Consolidated in *Hegan Basque Aerospace Cluster: History and Drivers , January 2017.*
[135] http://Bizkaia.hegan.com/Corporativa/PNoticias.aspx?vTUxxveJgQG13aF3qvgj3mS5EmN5Sbwa
[136] Ibid

Basque aerospace companies in aerostructures, engines, systems & equipment and Space encompasses a number of areas:

- Design and manufacturing of large equipped aerostructures (e.g. Wings, Stabilisers)
- Design and manufacturing of complete engine subsystems (e.g Low pressure turbines)
- Conceptual design; Detailed engineering; Integration and assembly components; Tooling and production systems; Machining and casting; Treatments and sheet metal; Composites; Testing and certification; Maintenance, repair and overhaul; Production solutions, and other areas.

Basque aerospace companies are engaged in major programmes across these areas:

Main Aerostructure:

- AIRBUS A350XWB – Risk Partners: AERNNOVA, ACITURRI, ALESTIS
- AIRBUS A380 – Risk Partners: AERNNOVA, ACITURRI, ALESTIS, NOVALTI
- AIRBUS A400M – Risk Partners: ACITURRI, ALESTIS
- BOEING 747-8I/F: AERNNOVA
- BOMBARDIER CSeries – Risk Partner : AERNNOVA
- DASSAULT Falcon 7X – Risk Partners: ACITURRI, ALESTIS
- EMBRAER ERJ 135/145 – Risk Partner : AERNNOVA
- EMBRAER 170/190 – Risk Partner: AERNNOVA
- EMBRAER Legacy / Phenom – Risk Partner: ALESTIS
- SIKORSKY S92 – Risk Partner : AERNNOVA

Engines:

- EPI TP400 – Consortium Member: ITP
- EUROJET EJ200 – Consortium Member: ITP
- MTRI MTR390E – Consortium Member: ITP
- PRATT & WHITNEY GTF – Risk Partner: ITP
- ROLLS ROYCE Trent 500/900 – Risk Partner: ITP
- ROLLS ROYCE Trent XWB – Risk Partners: ACITURRI, ITP
- TURBOMECA (all range) – Exclusive transversal agreement for special gears: DMP

Other programmes:

- AIRBUS A320/330MRTT/400M
- BOEING 747-8/LCF
- BOMBARDIER CRJ700/900
- CFM International CFM56, EADS-CASA C295, ESA,
- EUROFIGHTER TYPHOON, EUROCOPTER EC135,
- ROLLS-ROYCE Trent 700 / V2500 / BR725 / T56
- MARTIN BAKER, MESSIER DOWTY, NASA for other programmes.

Basque aerospace companies reflect a similar commitment to quality as observed with automotive companies. All companies adopted the EN9100 quality standard (building on ISO 9001) and NADCAP, with Primes, other customers and local company management driving cost reductions and quality requirements that over time have resulted in high adoption rates and a continuous cycle of improvement.

The Basque aerospace cluster mirrors the benefits offered by the automotive cluster in terms of location: a developed network of ports, airports, rail, and road facilities, and access to a skilled workforce from four universities and apprenticeship programmes. These are supported by Government funded initiatives with EU funding secured for some. Global Primes in aerospace such as Boeing, Airbus, Eurocopter, Bombardier, Embraer Sikorsky and others engage in production sub-contracting and assembly in wider clusters within Europe with additional developed aerospace clusters present. The Basque Country provides a strategic location from which these can be reached. Key aerospace markets and customers are located within a 1,000km radius including Spain, Portugal, France, Belgium, the UK, and the edge of Germany. France is located within a 500km radius and is Europe's leading aerospace market with an 8.5% growth in 2015 to revenue of €58.5 billion in 2015.[137] Continued growth in that market could induce a] 'pull-factor' for Basque aerospace firms supplying French customers, or those involved in collaboration or consortiums with French aerospace companies.

4.4 Energy Cluster

The Basque energy cluster is home to 343 companies that have a global combined turnover of €46.8 billion in 2016 and are present in 67 countries.[138] The cluster is represented by the industry body *Cluster Energia*. The Association's activities are similar to the automotive and aerospace cluster body activities: the active promotion and development of the cluster in the Basque Country. Energy cluster companies from the Basque Country employ 63,000 people globally, with 21,000 employed in the Country.[139] The Energy cluster reflects a degree of polarisation, with 20 companies accounting for 90% of employment in the Basque Country in three major segments: manufacturing, operators and distribution, and services and engineering. These include major global companies with operations in the Country and local companies such as *Iberdrola, Petronor, Gamesa, Bizkaia Energia, Arteche, Ormazabal, Valvospain, Elecnor, Sener,* and others. Bizkaia is also home to some of the biggest energy companies incuding *Iberdrola,* which is the world's third largest electricity utility a leading global wind energy company, employing 30,764 people globally in 40 countries.[140]

The cluster has a high proportion of small to mid-sized companies that comprise the majority of the organisations engaged energy across four major energy areas: smart grids, wind energy, wave energy, oil & gas. In addition, a further activity is occurring in three other energy areas: CSP, Energy Efficiency, and Storage. Renewable energy sources in the Basque Country accounted for 7% of total local energy demand in 2014, versus 3.9% in 2000. The rate of innovation and development for wind continues to grow, with the production of photovoltaic energy increasing rapidly as the Country accelerates the development of thermal and other renewable energy.[141]

[137] http://Bizkaia.ainonline.com/aviation-news/aerospace/2016-07-05/frances-aerospace-defense-and-space-sectors-are-prospering
[138] Cluster Energia supplied data, 2017.
[139] Ibid.
[140] https://Bizkaia.bizkaiatalent.eus/en/pais-vasco-te-espera/apuesta-de-futuro/bizkaia-principales-empresas/
[141] https://Bizkaia.theclimategroup.org/sites/default/files/etp_partnerprofile_basquecountry.pdf

One of the significant contributions that the Basque energy cluster makes both globally and in the Basque Country is in R&D. In 2014 members of the Basque Country cluster spent €1.3 billion globally on R&D, with €240 million of this spent locally in the Basque Country. This is forecast to grow to €1.9 billion globally and €373 million locally by 2020, with a compound average growth rate of 6.3% annually, and an increase of 43% between the two periods.[142] The energy cluster is characterised by significant innovation both in more established areas including oil and gas, but increasingly, in emerging areas of wind energy, smart grids and wave energy. R&D expenditure by energy companies in the Basque Country in 2014 reflected this balance, as depicted in Chart 16. The largest area of R&D investment was in Power Grids, at almost 30% of total spending in Energy R&D in the Basque Country (€69.5 million), followed by Wind Energy at 16% (€38.9 million), Oil at 9% (€20.3 million), and others areas.[143]

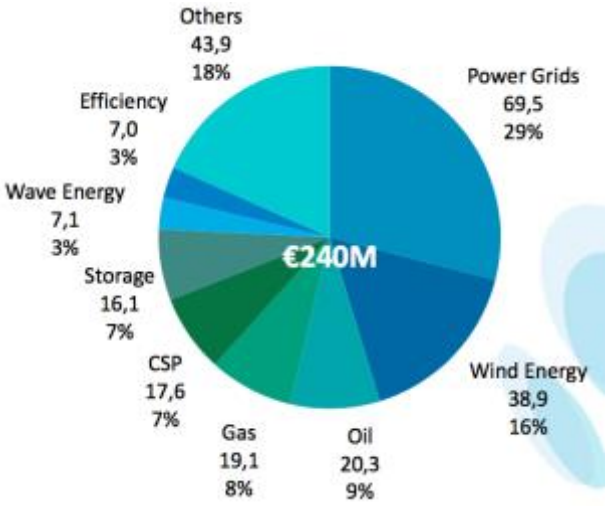


Chart 16: Basque energy cluster R&D

The focus on R&D and innovation is supported by a very strong and established network of facilities and skills including:

- The location in the Basque Country of two of Europe's major research and technology organisations, *IK4* and *Tecnalia*, with around 20% of their R&D focused on energy.
- A cooperative research centre, *CIC Energigune*, that leads Basque efforts in electrochemical and thermal storage research.
- 18 R&D business units and 7 competence centres for multinational companies (including GE, Schneider).
- Three universities that have a focus on energy research, *Universided del Pais Vasco, Mondragon University,* and *DeustoTech.*
- Infrastructure developed for demonstration and validation of projects including *Windbox, Ingrid,* and *Bimep.*

These are in turn supported by public institutions that have an engaged history of facilitating innovation and industry collaboration including: *Bizkaiko Foru Aldundia/Diputación Foral de Bizkaia, Eusko Jaurlaritza Gobierno Vasco, Gipuzkoako Foru Aldundia, Arabako Foru Aldundi/Diputación Foral de Alava, Grup Spri Taldea,* and *Eve.* The development of the energy cluster is further occurring through the Government's *Energy Technological and Industrial Development Strategy* ('EnergiBasque') that was renewed in 2016 and deployed around seven major areas of energy activity. Investment and R&D by major organisations along with Basque companies has positioned the Basque Country as a leading player in a number of energy areas in Spain: smart grids; offshore wind; CSP and wave energy.[144]

[142] Ibid.
[143] Ibid.
[144] Interviews with Basque energy companies and Cluster Energia.

The Basque Country has also taken a lead role in the EU in a number of energy projects including the *Vanguard Initiative.*[145] This is comprised of a number of countries pursuing the alignment of policies and instruments to drive growth in at a regional, national and European level. This is occurring through the adoption of practices that mobilise and align resources based on 'smart' specialisation principles and inter-regional cooperation through a cluster-based approach. The pilot, *Advanced Manufacturing for Energy applications in harsh environments* ('ADMA Energy'), is one of five pilots undertaken by the Vanguard Initiative, with the aim of positioning the EU as a world leader in the manufacture of components and robust and reliable solutions for offshore wind and offshore energy applications. This pilot reflects the considerable innovation occurring in the Basque Country in Energy. The four major areas of activity of wind and wave energy, oil & gas, account for 65% of the energy cluster activity in the Basque country and considerable innovation, R&D and employment. An overview of these key areas is presented, and their contribution to the Basque Country.

4.4.1 Wind Energy

The Basque Country is a leading global player in wind energy, with around 100 companies located in the Country with a turnover of €7.3 billion in 2014, and employing 15,000 people.[146] A strong industrial framework has been developed driven by leading local and international companies such as *Gamesa*, the world's fifth largest manufacturer of wind turbines currently merging with Siemens Wind to create one of the world's largest wind turbine companies, retaining its headquarters in the Basque Country; *Adwen*, a leading player in the offshore wind industry, with more than 600 MW installed at sea, and *Iberdrola*, a global leader in wind energy. Companies such as these have played a prominent role in the development of the market including over 22 GW installed in Spain alone since around 1995.[147] This experience and engagement in wind energy in the Basque Country has resulted in the creation of a strong value chain of activities such as design, manufacturing and service companies, with a significant cluster of suppliers and partners. This concertation includes three developers of offshore platforms. Figure 3 depicts the extensive value chain in the wind energy segment in the Basque Country energy cluster.

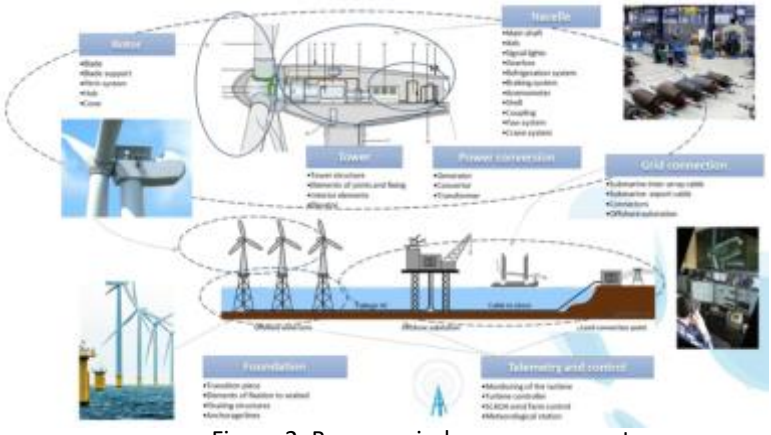


Figure 2: Basque wind energy segment

[145] See Bizkaia.s3vanguardinitiative.eu for further details.
[146] Cluster Energia supplied data.
[147] Interviews; Cluster Energia data.

Figure 3: Value chain in Basque Wind Energy
Source: *Cluster Energia*

The wind segment is forecast to grow globally: the installed wind power in the world at the end of 2015 was 11,027 MW with this figure estimated to increase by 2020 to 20-28 GW. An increase between 81%-154% in five years.[148] Between 2016-2017 alone, approvals to build wind farms for a total of 26 GW are expected to be granted, with a further 9 GW pending.[149] The wind energy segment in the Basque Country is characterised by significant R&D spend and employment: in 2014, €99.3m was spent in the Basque Country by wind energy companies, and 976 people employed in these activities, representing 6.4% of the wind energy workforce.[150] The Basque Country wind energy segment represents a prominent example of support from Government, with collaboration occurring across the three Provinces. The Basque Government has been implementing its *Advanced Manufacturing Strategy* that seeks to improve Basque industrial competitiveness through its Industrialisation Plan and Country Innovation Smart Specialisation Strategy (RIS3). Support has occurred from the Basque Government for Wind Energy projects including through the Department of Economic Development and Competitiveness and from the Basque Business Development Agency, SPRI, for the creation of an advanced manufacturing centre for the wind segment, 'Windbox'. An investment of €13m occurred to enhance the technological positioning and international competitiveness of suppliers of sub-systems and products for the wind segment. Collaboration has occurred with major wind and energy Basque companies including Adwen, Antec, Erreka, Gamesa, Hine, Glual, LauLagun and Wec; the engagement of Cluster Energia and the logistical support of IK4-Tekniker. This initiative seeks to develop equipment that permits the integration of multi-megawatt turbine systems over 5MW and includes nine organisations and four government agencies. The presence of these factors and the logistical and strategic advantages

[148] https://Bizkaia.clustercollaboration.eu/profile-articles/basque-wind-energy-companies-join-forces-sectors-most-important
[149] Ibid,
[150] Ibid.

present for the automotive and aerospace cluster, provide a developed base for the wind energy segment to continue developing as demand for alternative energy sources grows further.

4.4.2 Wave Energy

The Basque wave energy segment already has a 'head-start' with turnover of €8 million in 2014 and R&D expenditure of €7 million.[151] A core of around 30 companies are engaged in activities with additional companies engaged in the value chain. Wave energy is a smaller segment than other Basque energy segments reflecting its emerging status but strategic importance as an alternative energy source. Figure 4 depicts the wave energy value chain in the Basque Country.

Figure 4: Value chain in Basque Wind Energy
Source: Spri, Cluster *Energia*

This chain reflects activity in the major activities in wave energy: *core structural wave components; energy conversion systems; auxiliary converter equipment; mooring and positioning systems (fixed structures, mooring lines, maintenance and installation); grid connection (submarine, cable, connectors, onshore substations)*.[152]

The wave energy segment is supported by Government through the same initiatives and partnerships as occurs with the other energy segments. A strategic focus on this segment is expected to mirror trends internationally to harness alternative 'natural' energy sources. The Basque energy cluster has drawn on other manufacturing and production areas in the Country including shipbuilding and R&D from other energy areas of activity. This has created a strong value chain in wave energy from the outset of the segment and the creation of projects at an earlier stage than

[151] Spri. Marine Renewable Energy: Basque Country. European Week of Countries and Cities. Brussels. 10-13 October.
[152] Cluster Energia data and interviews.

often occurs with innovative new energy and technology areas. These include a number of pioneering and early-stage projects in Europe and internationally and some world-firsts:

- *Mutriku* is the world's first commercial wave plant launched in 2011 and to be connected to the grid, developed by Ente Vasco de la Energia. It is a wave-based power generation facility and test site for new wave concepts, with 16 turbines with a total capacity of 296kw. In the winter of 2015, the facility supplied its first GWh of electricity to the grid.[153]
- *Eve* (the Basque Energy Board) launched the OPERA project in 2016 to reduce open sea operating costs for wave energy, focusing on bi-radial turbine, advanced control systems, shared mooring system configuration, and elastomeric mooring tether.[154]
- *BIMEP* is a single platform for testing marine energy components and systems
- *Oceantec* is the first Spanish company to test its own 1:4 WEC prototype in a marine environment. The Company was also recently commissioned to install a wave energy device at Bimep.

Figure 5: Wave energy sites in Europe
Source: Cluster *Energia*

The Basque Country is in a strong position to benefit from wave energy through its location and coast.

Geographic locations between 30 and 60 degrees latitude in both the North and South Hemispheres receive the highest wave energy flows, varying between 20-70 kw/m. [155]

Around 44 wave energy sites exist off the Basque Coast.

[153] Ibid
[154] http://Bizkaia.construction21.org/articles/Bizkaia/wave-energy-in-the-basque-country.html
[155] http://Bizkaia.waveenergybasquecountry.com/en/the-basque-industry

4.4.3 Smart Grids

The Basque Country is an established and developed hub for smart grid technology encompassing power transmission and distribution networks. The segment is home to around 90 companies generating a turnover of over €14,000 million and employing around 23,000 people.[156] R&D expenditure is €92.8 million, with 758 employed in this area.[157] This area of energy integrates a wide range of industrial equipment, electronic systems and services into the grid to provide advanced functionality.

Multiple areas are involved in smart grids, with firms in Bizkaia and the Basque Country engaged in the manufacturing of key components. This includes high voltage and medium voltage equipment; power electronics and storage systems; power transformers; operating systems and applications; low voltage connectivity and management; metering equipment. Figure 6 depicts these key components.

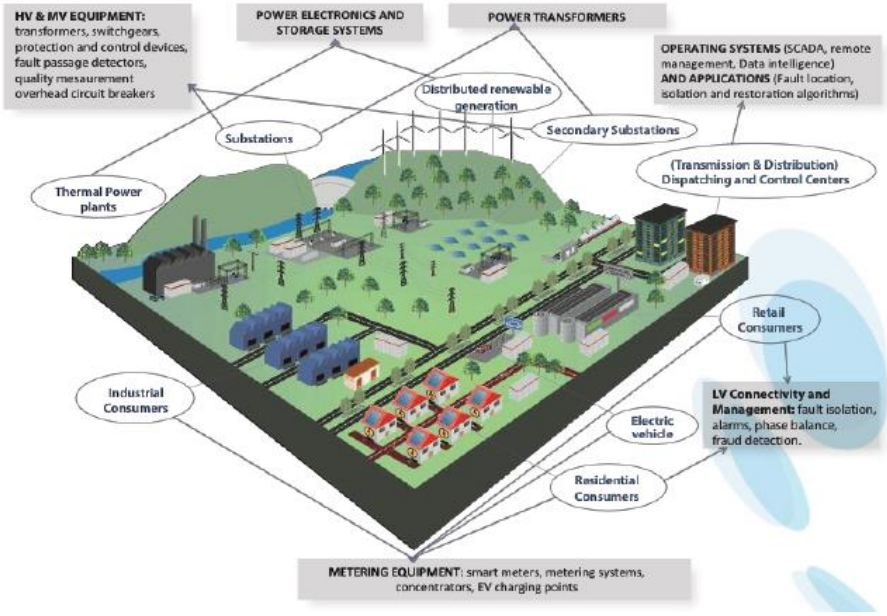


Figure 6: Major smart grid elements
Source: *Cluster Energia*

Bizkaia and other provinces in the Basque Country are home to numerous local, Spanish and international companies engaged in smart grids across a complex value chain. These include many companies already engaged in other energy areas in Bizkaia and other provinces in the Basque Country. Figure 7 depicts the complex value chain undertaking smart grid production in Bizkaia and other areas. The value chain depicts the embedded role that Administration plays in the development of the segment through multiple agencies, mirroring the engagement observed in other segments. This is a significant factor promoting the development of the segment with the use of a model observed in other segments in energy.

[156] Cluster Energia data.
[157] Ibid.

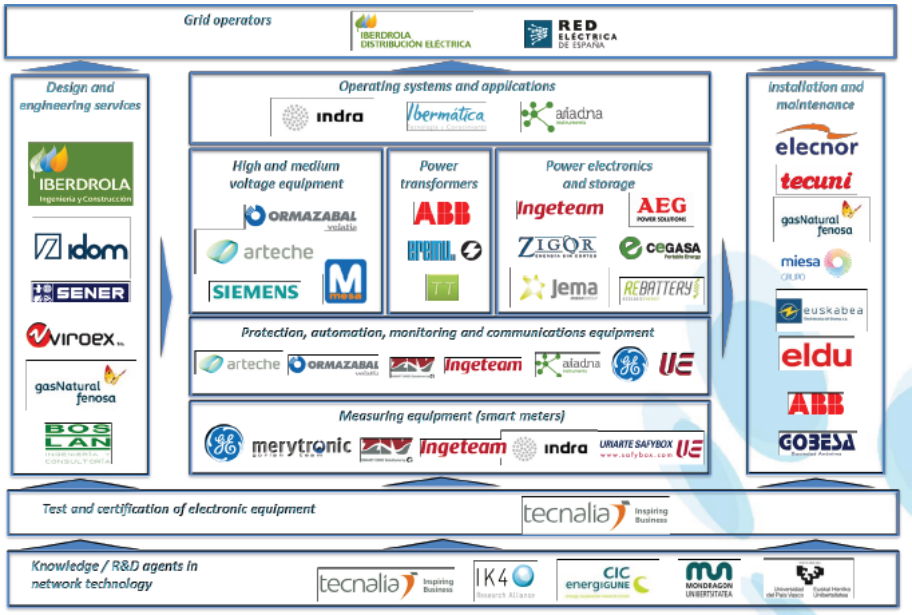


Figure 7: Basque Country smart grid value chain
Source: *Cluster Energia*

One of the most visible and large scale efforts to strategically develop grid technology in the Basque Country is *Bidelek Sareak*. This is a joint venture between the Basque Government and Iberdrola Distribucion Electrica. The aim of the project is to revamp the electricity grid in metropolitan Bilbao and provide equipment and systems suppliers in the Basque Country the opportunity to develop and test their smart grid technology, products, and services in a live environment and in the process create a reference point in Europe for smart-grid roll-out. The initiative has required an investment of €60 million in smart grid systems encompassing: the installation of 400,000 smart meters; the implementation of varying degrees of automation in 2,400 secondary substations and 3 high voltage substations, and the integration of distributed of distributed generation plants and electric vehicle charging stations.[158]

Leading companies have been involved in the initiative with many located in Bizkaia, including Arteche (using its ultra high-voltage laboratory) ZIV (smart-grid laboratory), CIC Enerigune (storage device research and testing centre), Ormazabal Velatia (high power and smart grid laboratory), IK4 battery assembly and testing laboratory), Ingeteam (power electronics and control laboratory). Bizkaia offers a relatively unique environment for the development of smart grid technology through integrated infrastructure for product experimentation testing and certification. Leading companies from Bizkaia and other locations are engaged grid technology across the value chain.

4.4.4 Oil & Gas

Oil and Gas is the most developed energy segment in Bizkaia and the Basque Country and accounts for one-third of its turnover. This segment is not covered in extensive detail in this report, with an overview provided. It employs 10,355 people and has a turnover of €17,985 million.[159] The segment accounts for 12% of the energy cluster's employment, and its R&D spending of €40 million accounts

[158] Cluster Energia data and presentations.
[159] Cluster Energia data.

for 6.3% of R&D expenditure in the cluster. To date, Basque and Bizkaia Oil and Gas companies have been engaged in the downstream components of the segment, although this has been changing with some engaged in upstream areas. The value chain of the segment reflects two global companies: *Petronon/Repsol* and *EDP Naturogas.* Bahia de Bizkaia (BBG) is a major participant in the market, with a recent €130 million investment in a third liquefied natural gas tank in Bilbao consolidating the City as the principal liquiefied natural gas gateway for the Atlantic Arc.[160] In addition, three combined power facilities exist from BBE, Bizkaia Energia and Iberdrole. The Oil & Gas segment is supported by a network of components manufacturers including *Ampo, Tubacex, Tubos Reunidos, Vicinay, Ulma,* and engineering companies such as *Idom, SENER,* and others.

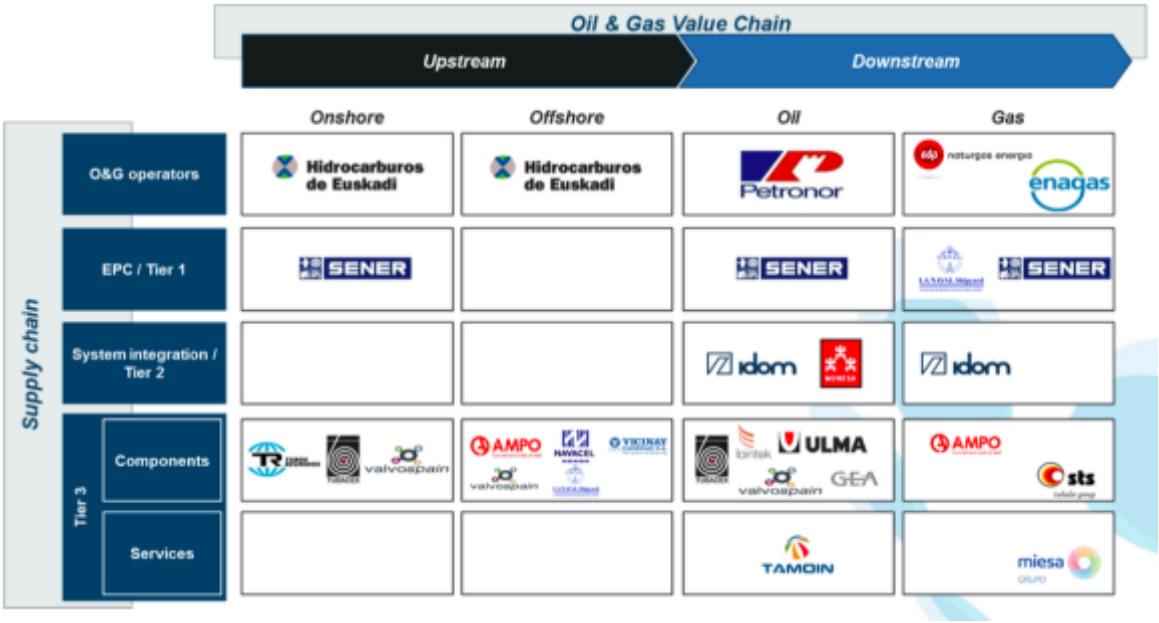
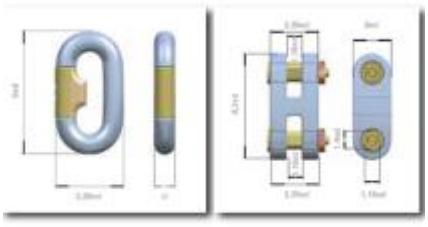


Figure 8: Basque Country oil & gas value chain
Source: *Cluster Energia*

This segment is characterised by a smaller number of major participants compared to the other energy segments, but the participants have considerable experience in this more established energy segment, serving a small number of operators. Activities are distributed across onshore, offshore and oil and gas with the supply chain including Tier One companies, system integrators, components and services. The oil and gas segment is forecast to grow at an annual rate of 1.5%, with 75% of the global investment of €4.7 billion between 2014-2020 to be made in the 'upstream' segment comprised of deep-water sites and non-conventional resources.[161] Bizkaia has a number of companies with a global market share supporting this segment including *Vicinay Cadenas*, that manufacturers offshore mooring accessories and marine amongst other products. The development of the Oil & Gas segment, and other energy cluster areas, is aligned with public-private partnership strategies and Government's R&D policies as encompassed by the RIS3 Smart Specialisation Strategy; the Basque Government's Industrialisation Plan 2016; and the European Union's R&D policies (Horizon 2020).[162]



[160] http://Bizkaia.bilbaoport.eus/en/news/third-bbg-gas-tank-consolidates-basque-country-gas-gateway-atlantic-arc/
[161] http://Bizkaia.clusterenergia.com/oil-gas-4
[162] http://Bizkaia.clusterenergia.com/strategic-plan

5. Management Practices

5.1 Firm Specific Factors: Defining Granular Productivity Enhancing Opportunities

Management practices are the cornerstone of a firm's operation and able to influence productivity.[163] These will be introduced in this section before the results from a sample of 10 firms drawn from the three clusters in Bizkaia are presented. Leading LSE-McKinsey research to date has confirmed that the adoption of attributes, such as good management practices along with technology use, display a statistically significant correlation with firm performance: *better performing firms are better run*.[164] Whilst no single model for productivity enhancement exists, firms can adopt a range of practices and strategies that maximise the potential for success in their specific environment. This section introduces the notion of management practices and the methodology utilised by the LSE to assess them within a firm, before dovetailing into an assessment of management practices in a sample of 10 Bizkaia firms drawn from the three clusters of automotive, energy, and aerospace.

5.2 Management Practices: The 'Lever' for Firm-Level Productivity Enhancement

"Human factors are more likely to cause failure than hardware and software deficiencies."

Howland, 2000

The term 'management practices' lacks a concrete definition. The concept can best be reviewed as an amalgamation of its two principal parts:

"Management":[165] *the process of leading and directing all or part of an organisation through the deployment and manipulation of resources.*

"Practice":[166] *the actual application of a plan or method, as opposed to the theories relating to it*.

The notion of management practices is broad, but can at a fundamental level be defined as *what an organisation's managers do: how they plan, deliver, and utilise the firm's assets, both human and capital.* Managers are 'influencers' in the use of the firm's assets with research highlighting that, *"top executives vary considerably in their management styles….raising questions as to why managers may behave so differently in apparently similar economic environments."*[167] Firms achieving better performance have been found to be better governed in general, with managers often receiving higher compensation as an incentive to maximise performance.[168] The firm's CEO or leader plays a crucial role in driving the firm's performance, strategy, and setting 'acceptable practices'.[169] No two managers are alike, with managers interpreting the same environment differently, and these interpretations leading to the development of specific policies and actions. These differences

[163] Ibid.
[164] Bloom, N., and Van Reenen, N. (2010). Why Do Management Practices Differ across Firms and Countries? Journal of Economic Perspectives. Vol: 24(1); pp: Pages 203–224.
[165] en.wikipedia.org/wiki/Management
[166] http://Bizkaia.askoxford.com/concise_oed/practice?view=uk
[167] Bertrand, M., and Schoar, A. (2003). Managing with Style: The Effect of Managers on Firm Policies. Quarterly Journal of Economics. Vol:118(4); pp: 1169-1208.
[168] Ibid.
[169] Lefebvre, L.A., Lefebvre, L., Mason, R., (1997). The Influence Prism in SMEs: The power of CEOs Perceptions on Technology Policy and Its Organisational Impacts, Management Science. Volume. 43(6)

ultimately affect organisational performance.[170] Management practices are more than the attributes of top managers however: over time they form part of the organisational structure and behaviour of the firm as they are defined by senior managers and adopted throughout the organisation.[171]

Managerial practices can be *strategic* and include business plans; vision statements; memos; technology plans; memos and presentations (ibid), or they can be *operational.*[172] They can include a broad range of activities including: HR practices; production practices; financial practices, and other functional practices such as Marketing and Operations. The ability of managers to embrace and adapt to new technology; engage in innovation, and address processes and elements that can improve their competitive position and productivity.[173] The main inhibitors for the exploitation of new technologies most often appear to be a lack of knowledge, poor management skills and qualifications for both entrepreneurs and employees.[174] Adopting best practices for the management of the firm is arguably the most influential and relevant means of improving its productivity and positioning it for long term success.[175]

5.3 Establishing Best Practices

"A large number of firms are extremely badly managed with ineffective monitoring, targets and incentives. We present compelling evidence that better managerial practices are significantly associated with higher productivity."

Bloom et al, 2005.

The exploration of firm-level management practices lacked quantification to address the query: *does management matter?* The LSE in partnership with leading global management consultancy McKinsey and Co, developed tools to quantify management practices commencing in 2002.[176] This utilised telephone interviews by trained analysts with a firm manager to assess 18 key practices, depicted in this section, and score the practices. Considerable testing of the methodology occurred with a sample prior to the project proceeding to this stage with the results confirming a statistically significant correlation between good management practices and firm performance, as measured by a number of key financial metrics. Additional in-firm reviews were undertaken for samples, that obtained similar scores to telephone interviews, further reinforcing the validity of the methodology. To date, the world's largest management practices survey results have been compiled, with 20,000 interviews undertaken with firm managers in 35 countries.[177]

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[170] Ibid.
[171] Bloom, N., et al, (2005). Op cit.
[172] Suitaris, V. (2001). Strategic Influences of Technological Innovation in Greece. British Journal of Management. Volume12; pp: 131-147.
[173] Chesbrough, BIZKAIA. (2006). Open Business Models: How to Thrive in the New Innovation Landscape. HBS.
[174] Buhalis, D., Deimezi, Q., (2003). IT Penetration and E-commerce: Developments in Greece, Electronic Markets. Volume 13(4); pp309-324.
[175] Bloom, N., and Van Reenen, J. (2010). Why Do Management Practices Differ across Firms and Countries? The Journal of Economic Perspectives: Vol: 24(1); pp: 203-224.
[176] This research was undertaken by the LSE's Centre for Economic Performance, a leading interdisciplinary European economics research centre, in collaboration with McKinsey and Co, before becoming the *World Management Survey.* It remains the leading research on management practices at firm-level globally.
[177] Bloom, N., et al. (2005). Op Cit.

This work remains the only empirical investigation on this scale to assess key firm-level factors contributing to productivity.[178] These best practices have been found in general to be agnostic of firm location. Other factors can facilitate productivity such as the proximity of firms to each other and other participants in their value chain in *clusters*.[179] Greater productivity can in turn attract higher skills, including access to 'economic mass': major cities, clusters, or locations that offer the required factors of production and opportunities for employment and materials. Figure 9 depicts how regional productivity can be enhanced when access to these occurs.

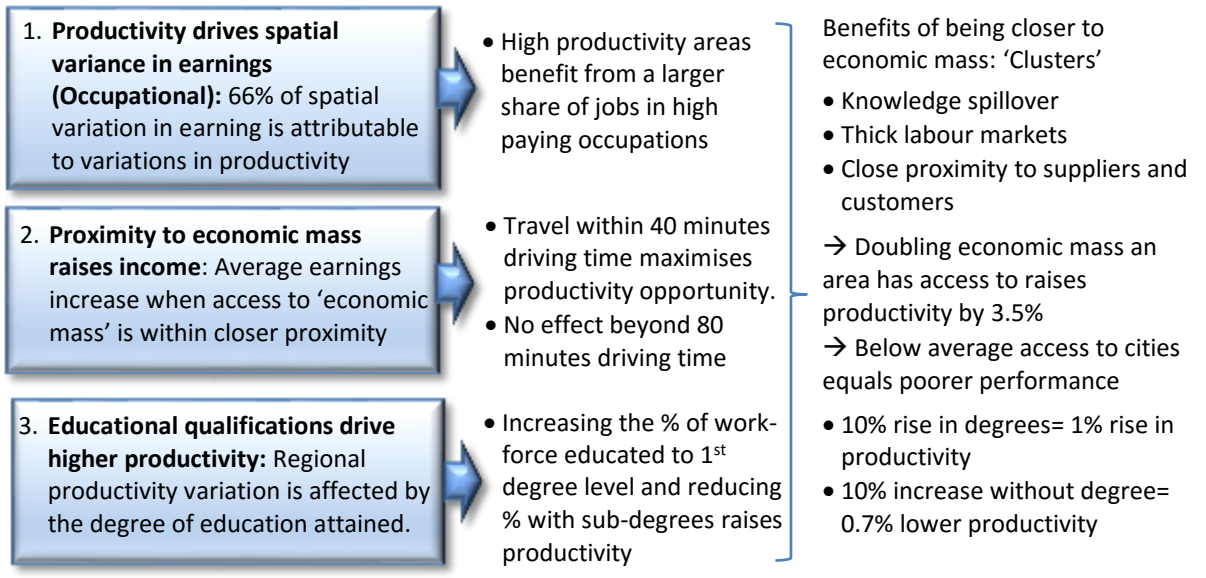

Figure 9: Key drivers for regional productivity variations
Source: Rice, P., and Venables, (2004)[180]

The clusters in energy, automotive and aerospace in Bizkaia and other Basque areas display attributes from this schema:

(1) Already productive areas influence earnings through the creation and attraction of higher paying jobs, often requiring greater skills and complexity- this creates further demand;
(2) Proximity to larger cities, or areas with a concentration of facilities ('economic mass') can raise income and productivity, with the density of activity having been shown to have a positive effect on productivity;
(3) The mix of education in the population, with a higher proportion of the working population having degrees increasing productivity.[181]

Benefits exist in firms being closer to 'clustered' cities, or locations of concentrated industries in terms of knowledge transfer between individuals and organisations to foster productivity and innovation.[182] A 10% reduction in average journey times can raise productivity by 1.2%-2.4%,[183] with below average access to cities estimated to be a contributing factor to poorer performance.[184]

[178] The methodology, sample set, questionnaires and other elements are available at: http://worldmanagementsurvey.org
[179] Rice, P., and Venables, J. (2004). Productivity: understanding regional differences. CEP Discussion Paper 162. Centre for Economic Performance. London School of Economics and Political Science.
[180] Ibid.
[181] Ibid.
[182] Muro, M., and Katz, B., (2010). The New 'Cluster Moment': How Regional Innovation Clusters Can Foster the Next Economy, in *Entrepreneurship and Global Competitiveness in Regional Economies*; Chapter 5; pp:93-141. Emerald.
[183] Rice, P., and Venables, J. (2004). Op cit.
[184] Ibid.

The options available to diminish some of the productivity variations highlighted are *structural* and potentially are affected by Government policies for longer term growth and in a dynamic capacity. Managers dictate location and undertake recruitment to attain the required mix of skills and qualifications for the organisation, whilst individuals make choices on where to work and the education they attain. Such decisions are often complex and ensconced within broader social, financial, and other considerations. Firms and individuals may directly factor mass proximity into their decisions or in other cases, this is a secondary factor.

5.4 Addressing Management Practices to Optimise Firm-Level Productivity

A firm's management practices drive the crafting and execution of strategies that can maximise productivity.[185] 'Bad practices' corrected can transform a business and escalate its productivity.[186] The applicability of the LSE-McKinsey research and its utilisation in over 20,000 instances in 35 countries is replete with examples of managers who have reviewed their business and improved performance by addressing four practices in operations, performance, targets and talent:

- Operation Management*: How effectively have modern management techniques been introduced in the company: why were these modern processes introduced, for how long have these practices been in place, how are other departments of the company, outside of the company, involved in implementing these processes?*
- *Performance monitoring: How well does the performance monitoring system inform managers and their employees' of their day-to-day operations: how do processes and attitudes are screened, how meaningful are metrics in relation to how frequently they are measured and reviewed, to what degree the detection of different levels of process-based performance leads to adequate and consequential process?*
- *Target setting: How tightly are targets linked to the company's wider objectives: are targets covering a sufficiently broad set of metrics, how strongly are short and long term targets connected, how well are they cascaded down and clarified to workers?*
- *Talent management: How are people managed: to what degree is people management emphasized within the company, how careful are hiring policies, how closely are pay and promotions linked to the ability and effort of employees, how are under-performers dealt with, and how are best-performers retained?*

A total of 18 sub-areas have been defined across these practices and provide the opportunity to review and address a firm's operation. The initial and predominant management practices approach that commenced over a decade ago has been developed to assess a manufacturing/production driven environment. This has also been adapted to cover *retail, hospitals* and *schools*. The fundamental four practices underpinning these are the same however with variations occurring in the 18 sub-areas to adapt them for relevance. Table 10 defines the manufacturing/production focused approach to assess management practices that forms the core approach.

Manufacturing/Production Firm	
Operations Management	
Modern techniques	What modern or lean practices have been adopted? Best practices*: All major aspects of modern/lean manufacturing have been introduced (Just-in-time, automation, flexible manpower, support systems, attitudes and behaviour) in a formal way*

[185] Bender, S., et al. (2016). Management Practices, Workforce Selection and Productivity. CEP Discussion Paper No 1416. Centre for Economic Performance. London School of Economics and Political Science.

[186] https://hbr.org/2012/10/the-radical-beauty-of-three-si

Rationale for adoption	What factors led to their adoption? Best practices: Modern (lean) manufacturing techniques were introduced to enable us to meet our business objectives (including costs)
Performance Monitoring	
Process documentation	How are problems exposed and corrected? Best practices: Exposing problems in a structured way is integral to individuals' responsibilities and resolution occurs as a part of normal business processes rather than by extraordinary effort/teams
Performance tracking	What kind of indicators are used for performance tracking? Best practices: Performance is continuously tracked and communicated, both formally and informally, to all staff using a range of visual management tools.
Performance review	How do you review these performance indicators? Best practices: Performance is continually reviewed, based on indicators tracked. All aspects are followed up ensure continuous improvement. Results are communicated to all staff
Performance dialogue	How do you review these performance indicators? Best practices: Regular review/performance conversations focus on problem solving and addressing root causes. Purpose, agenda and follow-up steps are clear to all. Meetings are an opportunity for constructive feedback and coaching.
Consequence management	What would happen if a follow up plan agreed during one of your meetings were not enacted? Best practices: A failure to achieve agreed targets drives retraining in identified areas of weakness or moving individuals to where their skills are appropriate
Target Setting	
Type of target	What targets are set for the company? Best practices: Goals are a balance of financial and non-financial targets. Senior managers believe the non-financial targets are often more inspiring and challenging than financials alone (e.g. 60% market share by 2003)
Interconnection of goals	What is the motivation behind your goals and how are they cascaded down to the individual workers? Best practices: Corporate goals focus on shareholder value. They increase in specificity as they cascade through business units ultimately defining individual performance expectations.
Time Horizon	What kind of time scale are you looking at with your targets? Are your goals set independently of each other? Best practices: Long term goals are translated into specific short term targets so that short term targets become a "staircase" to reach long term goals
Goals are stretching	How tough are your targets? Do you feel pushed by them? Best practices: Goals are genuinely demanding for all divisions. They are grounded in solid, solid economic rationale
Clarity of goals and measurement	If your staff were asked about individual targets, what would they say? Best practices: Long term goals are translated into specific short term targets so that short term targets become a "staircase" to reach long term goals

Talent Management	
Instilling a talent mindset	How do senior managers show that attracting and developing talent is a top priority in your company? Best practices: Senior managers are evaluated and held accountable on the strength of the talent pool they actively build
Building a high performance culture	How does your appraisal/reward system work? Best practices: We strive to outperform the competitors by providing ambitious stretch targets with clear performance related accountability and rewards
Making room for talent	If you had a worker who could or would not do his/her job what would the company do? Best practices: Long term goals are translated into specific short term targets so that short term targets become a "staircase" to reach long term goals
Developing talent	How would you identify and develop your star performers? Best practices: Long term goals are translated into specific short term targets so that short term targets become a "staircase" to reach long term goals
Creating a distinctive employee value proposition	What makes it distinctive to work at your company as opposed to your competitors? Best practices: We provide a unique value proposition to encourage talented people join our company above our competitors
Retaining talent	If you had a star performer who wanted to leave what would the company do? Best practices: We do whatever it takes to retain our talent.

Table 10: Management practices check-list for manufacturing/production businesses
Source: LSE-McKinsey Management Matters Survey. Also available online[187]

This approach is valid across organisational types including corporates, large firms, and small to medium enterprises.

5.5 Why Does Management Matter?

Identifying, correcting and utilising better management practices have been shown to be effective in improving firm performance.[188] Extensive research and the real-world application of principles to improve management practices since 2002 has confirmed the potential results available to firms that can manage better:[189]

- Defects reduced by 50%;
- Inventory reduced by 2 %;
- Output raised by 10%;
- Firms that improve practices by 1 point in the review of their operations correlate with significant potential performance improvements:
    - 23% higher productivity
    - 14% higher market capitalisation
    - 1.4% higher annual sales growth rate

[187] http://worldmanagementsurvey.org/benchmark-your-organization/benchmark-your-manufacturing-firm/
[188] https://hbr.org/2012/10/the-radical-beauty-of-three-si
[189] Ibid.

The improved results from enhanced management practices carry numerous organisational benefits, with firms in Bizkaia depicting results that positioned them in top 10th percentile of global samples:

- *Staff retention*: Rewarding and keeping good employees longer has a positive impact on the firm, with the average financial impact of the loss of an employee estimated to be £30,000, comprised of a loss of output (£25,000) and the logistical cost of absorption of a new worker (£5,000).[190] Labour turnover was estimated to cost the UK economy £4.1 billion in 2013.[191] *Firms in Bizkaia had amongst the lowest turnover observed in MP research to date;*
- *Inventory management*: Reducing the firm's inventory, accounts outstanding, and cash conversion cycle improves the firm's value and profitability.[192] Addressing practices in this area can generate rapid results for the firm. *Firms in Bizkaia scored between the top 5th-15th percentile for operational best-practices including just-in-time and other inventory areas.*
- *Faster and more accurate production:* Applying simple lean and modern streamlining principles and consolidating teams to improve local workflows can produce rapid gains within three weeks to two months. More complicated issues that require longer data collection and analysis can take six to eighteen months.[193] The benefits can be dramatic, with Ford in the US increasing productivity by 30% of front axles for its trucks and SUV's that resulted in an additional $2 billion in profit.[194] *The average operational practices of firms in Bizkaia placed them in the top 5th percentile of all firms sampled to date.*
- *Linking strategy with delivery*. A continuous review and improvement process to set appropriate targets and 'extend' the firm's managers and employees to deliver can sustain profitability and productivity.[195] Results have found that productivity is optimised when targets are explicitly included in strategic/business plans and utilised subsequently within the firm and linked back to this.[196] *The average practices of firms in Bizkaia in target setting and execution placed them in the top 5th percentile of all firms sampled to date.*

6. Bizkaia Management Practices

6.1 Methodology

A total of 10 companies were reviewed in Bizkaia, utilising the LSE management practices methodology. The firms were drawn from collaboration and engagement with the three clusters in aviation, energy and automotive. The distribution of firms was not uniform, with half of the sample reflecting energy, followed by automotive and a small number of aerospace. The distribution reflected the availability of key individuals; the logistics of travel to engage with the firms, and the time-horizon over which access was required, in Q1 2017. The majority of the firms were SMEs, with the majority employing greater than 250 employees. Turnover varied from €50 million to over €300 million. All firms were located in Bizkaia, including their headquarters.

[190] Oxford Economics-Unum. (2014). The Cost of Brain Drain.
[191] Ibid.
[192] Garcia-Turel, P., J., and Martinez-Solano, P. (2007). Effects of working capital management on SME profitability. International Journal of Managerial Finance. Vol: 3(2); pp.164 – 177.
[193] Taj S., and Berro, L. (2006). Application of constrained management and lean manufacturing in developing best practices for productivity improvement in an auto-assembly plant. International Journal of Productivity and Performance Management. Vol. 55(3/4); pp. 332–345.
[194] Robinson, R. (1999). Welcome to OR territory OR/MS Today. August; pp. 40-3.
[195] McAdam, R., and Bailie, B. (2002). Business performance measures and alignment impact on strategy. International Journal of Operations & Production Management. Vol: 22(9); pp. 972–996.
[196] Ibid.

For half of the sample, the standard methodology was utilised: telephone interviews with a firm manager drawn from a managerial function that could discuss the firm's operation in detail. This included functions such as a Production Manager, Manufacturing Manager, Operations Manager, Managing Director, Commercial Manager, International Manager, or Finance Manager. In around one third of the initial telephone interviews, two senior managers from each firm were interviewed. For the remaining firms, initial telephone interviews were followed up with company visits. This included additional discussions with Shift Managers, Plant Managers, and others. In all cases, the interviews were re-run but in an informal manner, including during plant tours and other discussions. The firms were all located in Bizkaia within a 30km radius of Bilbao. The feedback and scores defined in telephone interviews was consistent with that captured and observed in site visits, confirming the validity of the approach and the replicated feedback of individuals interviewed.

6.2 Management Practices Overview in the Clusters

Little variation was observed between the scores in the three clusters in the sample firms. The tool developed by the LSE in conjunction with McKinsey & Co has been utilised in its current evolved form in the *World Management* Survey. This provides an automated tool to table practices and generate results in a comparative manner across a number of areas including average scores by country, company size, and industry average. Four core areas of practices were reviewed: *Operations Management; Performance Monitoring; Target Setting; Talent Management.* Overall, the firms reviewed displayed a high standard of management practices irrespective of the cluster. The sample is not random and recognition exists that the firms represented a mix of those able to participate within the parameters of the study. A number of factors affected the mix of scores obtained, reflecting the background and circumstances of firms and their managers:

- Energy: The greatest variation in firm-types was observed in the energy firms visited. This reflected some firms being in transition to enhance their practices and production. Overall, practices were high, but some adjustment was occurring in some firms.
- Aerospace: A small sample was represented, with some firms engaged in this cluster in addition to other clusters. These firms reflected a high standard of practices in their non-aerospace businesses that were being replicated in aerospace.
- Automotive: The firms in this cluster displayed variation similar to energy firms, with some engaged in upgrading their practices as part of reviews planning activities

Management practices are often influenced by a firm's customers: all three clusters in Bizkaia include international Primes and other major customers that often specify minimum manufacturing and quality standards for their contractors. This includes auditing their operations and providing support to implement these where they are lacking. Feedback from managers indicated that close collaboration with customers had led to an enhancement of their practices over time.

6.3 Bizkaia Management Practices: Average for the Three Clusters

Using the methodology outlined in the previous section, the average scores for each of the three clusters are presented in the following sections. This is preceded by the average score for all firms in Bizkaia in the sample. All results are anonymised to protect individual firm-results. Scores from the interviews are presented first for each cluster, followed by an average score in three areas for comparison:

- ‘Your Score’: The score of the firm (or average for a group of firms) assigned from the interviews and visits.
- ‘Country Average’: An average score from the global database has been used reflecting the average from firms across the entire 20,000 interviews undertaken to date.
- ‘Industry Average’: An average score applicable to the industry being assessed has been utilised.
- ‘Size Average’: An average score for the firm size has been included.

The ‘Industry Average’ category has utilised a general manufacturing category for the sample, reflecting the varied manufacturing businesses being assessed. The ‘Size Average’ utilised for all firms was for >250 employees. As depicted in the previous section, each firm’s practices were scored on a scale of 1-5 with 1 representing fewer best-practices, and 5 representing the presence of best-practices.

The firms reviewed in Bizkaia displayed very strong management practices on average, compared to all areas: country (global) average; industry average and size average. The average scores across all three clusters of automotive, energy and aerospace are presented in Table 11.

Question	Your Score	Country Average	Industry Average	Size Average
1 Introduction of lean (modern) manufacturing techniques	4	2.76	2.59	2.95
2 Rationale for lean (modern) manufacturing	5	2.90	2.98	3.06
3 Process documentation	4	3.13	3.03	3.30
4 Performance tracking	4	3.35	3.12	3.55
5 Performance review	4	3.33	3.14	3.51
6 Performance dialogue	4	3.18	3.08	3.36
7 Consequence management	4	3.17	2.93	3.29
8 Type of targets	4	2.89	2.75	3.05
9 Interconnection of goals	4	3.01	2.79	3.20
10 Time horizon	4	2.97	2.80	3.15
11 Goals are stretching	5	2.99	2.83	3.11
12 Clarity of goals and measurement	4	2.66	2.55	2.81
13 Instilling a talent mindset	3	2.42	2.50	2.58
14 Building a high performance culture	4	2.59	2.62	2.74
15 Making room for talent	4	3.07	3.09	3.15
16 Developing talent	4	3.01	3.03	3.12
17 Creating a distinctive employee value proposition	5	3.06	3.08	3.18
18 Retaining talent	4	2.55	2.59	2.58

Table 11: Average scores for firms from all three clusters in Bizkaia

The results indicate that on average the sample firms’ practices outperformed the country, industry and size average across all of the 18 practices. A number of key observations including areas where the highest score of 5 was obtained:

- The implementation rationale for lean practices was very strong and demonstrable through documentation, communication, factory noticeboards, and other indicators, reflecting strong drivers in firms to optimise business objectives with lean;
- All firms reviewed reflected goals being stretching, citing examples of growth targets and the need for the business to achieve these;
- Firm managers believed that the employee value-proposition of the firm was ‘distinct’ and separated it from others to attract talent and define its position with customers and the market. This was demonstrated through activities such as engagement with universities, industry events, knowledge centre membership, and others.

Other practices obtained scores of 4, with some high scores of 3 skewing this to 4.

The sample average across all firms placed the firms in Bizkaia in the top 5th percentile across all three areas for comparison: country comparison (using global average scores); manufacturing category used for comparison and against the company size results (>250 employees).

The area of Operations Management reflected very high practices, placing the average score in the top 5th percentile across all three comparative areas as well. This was reinforced through site visits and extended interviews with additional managers and other staff in the firms with evidence of lean and its rationale very strongly tied to objectives.

Performance Management exceeded the average scores across all categories, placing firms in the top 10th percentile for comparisons globally and in the comparison category, and in the 15th percentile against comparable company size. Strong practices were observed and captured through interviews encompassing documentation utilised day-to-day; communication of performance and metrics to employees and between managers, and how production is addressed if issues emerge.

Target setting was an area of strength for firms in Bizkaia. Consistently high scores were obtained placing the average score in the top 5th percentile against a global average and category comparison and in the 10th percentile against comparable company size. Strong evidence was observed for target construction occurring in a cascaded manner and the communication of targets and other

related activities. A general observation across all the firms was the high degree to which managers communicated targets, planning and strategy included regular 'all-hands meetings', newsletters, displays of objectives, and other activities.

The remaining area that firms in Bizkaia displayed high scores was talent management, placing firms in the 5th percentile across all the comparison areas. This was an area where local specific elements were observed to influence the approach to talent management including cultural, social and economic factors. One of the major deviations between firms in Bizkaia and the average observed in other countries was how employees who were observed to be under-performing were addressed. This occurred expediently with options including moving the person into other areas; re-training; providing additional training; non-work intervention if personal issues were a cause, and in general the adoption of a more 'holistic' approach without compromising the production output of the person's team. A second observation was the emphasis on the promotion of good performers, in the majority of cases without additional monetary rewards (or incremental), but through expanded responsibilities, promotions, additional training/courses, rotations to other locations/countries, and others. These factors reflected the confidence displayed by all managers that their company depicted a 'unique' employee value proposition.

6.4 Management Practices in the Clusters

The management practices for the firms assessed within each of the three clusters are presented in this section.

6.4.1 Energy

The practices of the energy firms reflected a wider base of firms and at varying stages of enhancing their practices. All firms had been engaged in the manufacturing of various components in the energy cluster across both emerging and other energy types. The firms were experienced in both manufacturing and production principles with some at more advanced stages of lean adoption,

whilst others were engaged in upgrading already strong practices to ‘best-practices’. The average scores across all of the firms assessed are summarised in table 12.

Question	Your Score	Country Average	Industry Average	Size Average
1 Introduction of lean (modern) manufacturing techniques	4	2.76	2.98	2.95
2 Rationale for lean (modern) manufacturing	5	2.90	3.12	3.06
3 Process documentation	4	3.13	3.26	3.30
4 Performance tracking	4	3.35	3.39	3.55
5 Performance review	4	3.33	3.43	3.51
6 Performance dialogue	4	3.18	3.31	3.36
7 Consequence management	4	3.17	3.28	3.29
8 Type of targets	4	2.89	2.91	3.05
9 Interconnection of goals	4	3.01	3.09	3.20
10 Time horizon	4	2.97	3.16	3.15
11 Goals are stretching	5	2.99	3.13	3.11
12 Clarity of goals and measurement	4	2.66	2.68	2.81
13 Instilling a talent mindset	3	2.42	2.63	2.58
14 Building a high performance culture	4	2.59	2.72	2.74
15 Making room for talent	4	3.07	3.09	3.15
16 Developing talent	4	3.01	3.17	3.12
17 Creating a distinctive employee value proposition	5	3.06	3.16	3.18
18 Retaining talent	4	2.55	2.75	2.58

Table 12: Average scores for energy firms sampled in Bizkaia

The firms all displayed 'scores that were higher than country, industry and size average scores for the cluster. The same best-practice scores were observed in the energy group as other clusters: rational for lean; goals are stretching; the creation of a distinct employee proposition. The only score of 3 was observed for ‘instilling a talent mind set’. Some firms did not display a very high degree of ingrained responsibility for managers developing and being accountable for the development of talent. This was partly cultural, with a more ‘relaxed’ approach to talent management observed than in many other countries. The following summarises the average scores across the 18 practices for the energy companies.

The monitoring of performance reflected strong practices, but at a marginally lower score than for the other areas. This positioned firms in the top 20th percentile against the country sample and the segment in the cluster, but in the 25th percentile against firms above 250 employees. Firms in Bizkaia still performed strongly in Performance Monitoring against the average scores across all benchmarks, as depicted in the summary below.

One of the strongest areas was in target setting, with many firms showing best-practices in the development of linked targets and their communication. This was visible in the production facilities and head offices of companies and was a theme observed in larger and smaller firms. The following summary illustrates the degree to which energy firms in Bizkaia outperformed other comparison groups.

The area of Talent Management reflected the same practices observed across all firms, irrespective of cluster: managers were committed to the development of employees and the recognition of high performers with options available to them. Poor performers were depicted as being 'few' and retention rates across firms were very high, with the average tenure across all firms being between 10-15 years. This reflected a high degree of skilled employee use, both in the production processes and managerial and R&D areas. Employees in many tooling and shop-floor activities had undergone training and gained experience over a number of years in specialised areas, and remain in their roles for longer periods than in many other countries. This observation is also congruent with economic indicators observed such as lower unemployment and higher GDP per capita in Bizkaia and the Basque Country than Spain and other countries.

6.4.2 Automotive

The automotive cluster displayed the greatest degree of internationalisation amongst all three clusters in terms of foreign plant production. It is also one of the most developed cluster with some firms celebrating their 50th year, such as BATZ. Very similar scores were observed for Automotive firms in Bizkaia and those in the energy cluster in particular. This was mirrored by aerospace firms for many areas, but with some variations observed in Talent Management. Overall, firms in the Automotive cluster outperformed the other three benchmarks as depicted in table 13.

Question	Your Score	Country Average	Industry Average	Size Average
1 Introduction of lean (modern) manufacturing techniques	4	2.76	2.98	2.95
2 Rationale for lean (modern) manufacturing	5	2.90	3.12	3.06
3 Process documentation	4	3.13	3.26	3.30
4 Performance tracking	4	3.35	3.39	3.55
5 Performance review	4	3.33	3.43	3.51
6 Performance dialogue	4	3.18	3.31	3.36
7 Consequence management	4	3.17	3.28	3.29
8 Type of targets	4	2.89	2.91	3.05
9 Interconnection of goals	4	3.01	3.09	3.20
10 Time horizon	4	2.97	3.16	3.15
11 Goals are stretching	5	2.99	3.13	3.11
12 Clarity of goals and measurement	4	2.66	2.68	2.81
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15 Making room for talent	4	3.07	3.09	3.15
16 Developing talent	3	3.01	3.17	3.12
17 Creating a distinctive employee value proposition	5	3.06	3.16	3.18
18 Retaining talent	4	2.55	2.75	2.58

Table 13 Average scores for automotive firms sampled in Bizkaia

The overall practices observed in the automotive cluster placed the firms in Bizkaia the top 5th percentile of firms in the global database ('country average') and industry average, and in the top 10th percentile for firms in the same size category (<250 employees). Firms obtained the highest score in the same areas as firms from other clusters: Rationale for Lean, Stretching Goals; a Distinctive Employee Proposition. The following table summarises the overall results with firms positioned in the top 5th percentile for global results and in the same segment, and in the 10th percentile for firms over 250 employees.

Automotive firms in Bizkaia were particularly strong in operations, reflecting both the customer base served that are global, leading brands with a history of 'quality' and best-practices. Interviews confirmed that over time, local firms in Bizkaia had developed better practices to assist them in attaining their business objectives and from requirements by these customers. This resulted in firms in Bizkaia being positioned in the top 5th and 10th percentile of global firms surveyed, and within the assessment category respectively. They were also in the top 5th percentile of same sized firms.

Performance Monitoring practices were observed to be high, with automotive firms in Bizkaia engaged in good practices in this area. This included the creation of performance metrics and their communication and utilisation in the firms. These were observed to be prevalent and utilised in the majority of firms at shop-floor level and between managers. Some firms were upgrading their communication and display of targets. The following table summarises the practices in this area with firms in Bizkaia positioned in the top 20th percentile against the global sample and in the 25th percentile against firms in the same category and size.

Automotive firms also displayed good practices in target setting, with an integrated degree of targets observed, cascaded throughout the firms and with a mix of financial and non-financial targets utilised. This is reflected in the comparative practices results, with firms in Bizkaia positioned in the top 5th percentile against the global sample, and in the top 10thpercentile for the comparison category and size segment.

The uniformity of the approach to managing talent was observed across the majority of firms in Bizkaia. This was reflected by the automotive firms, with practices placing firms in the top 5th percentile of global firms and in the 10th percentile against the category for assessment. Firms scored in the top 5th percentile against comparable sized companies. Cultural and social factors to the management of talent were observed that created a stronger reciprocal culture of respect between the employees, managers and the community. This translated into higher practice scores.

6.4.3 Aerospace

The sample for aerospace reflected practices from a mixture of influences, including firms that had developed an aerospace business and in the process, utilised some existing practices. The results for the aerospace firms in Bizkaia were similar to the other two clusters in the case of the first three groups of practices. Some variation was observed in the last area, Talent Management, reflecting some more transitory activities as the aerospace companies were consolidating a market position. The variation with the energy and automotive clusters was in Talent Management, with marginally lower scores assigned. These reflected less of a defined effort for talent management to be instilled in managerial accountability, but this did not reflect the considerable effort observed for managers to ensure that employees were developed and rewarded when performing well. As with other firms in Bizkaia, 'reward' was most often defined by employees being provided with development opportunities in the form of training; promotion; overseas postings; and other non-monetary rewards, in addition to any pooled and individual bonuses where this occurred.

Question	Your Score	Country Average	Industry Average	Size Average
1 Introduction of lean (modern) manufacturing techniques	4	2.76	2.59	2.95
2 Rationale for lean (modern) manufacturing	5	2.90	2.98	3.06
3 Process documentation	4	3.13	3.03	3.30
4 Performance tracking	4	3.35	3.12	3.55
5 Performance review	4	3.33	3.14	3.51
6 Performance dialogue	4	3.18	3.08	3.36
7 Consequence management	4	3.17	2.93	3.29
8 Type of targets	4	2.89	2.75	3.05
9 Interconnection of goals	4	3.01	2.79	3.20
10 Time horizon	4	2.97	2.80	3.15
11 Goals are stretching	5	2.99	2.83	3.11
12 Clarity of goals and measurement	4	2.66	2.55	2.81
13 Instilling a talent mindset	3	2.42	2.50	2.58
14 Building a high performance culture	3	2.59	2.62	2.74
15 Making room for talent	4	3.07	3.09	3.15
16 Developing talent	3	3.01	3.03	3.12
17 Creating a distinctive employee value proposition	5	3.06	3.08	3.18
18 Retaining talent	3	2.55	2.59	2.58

Table 14: Average MP scores for Aerospace firms sampled in Bizkaia

The average aerospace scores indicated that the firms were in the top 10th and 5th percentile against the global average and the category for comparison respectively. The firms were also in the top 10th percentile against the comparable sized companies (<250 employees).

Firms engaged in aerospace depicted strong operations expertise and practices. These were observed to be diffused throughout the organisation and embodied best-practices in Lean. They positioned firms in the top 5th percentile across all comparison categories.

Firms depicted a mix of very strong practices and good practices in performance monitoring. An overall high standard was observed, with the depiction, communication and use of performance metrics observable and with the required metrics. Firms were positioned in the 20th and 15th percentile of firms globally and within this comparison category, and in the 25th percentile for firms of comparable size (<250).

Target setting was an area that displayed strong practices. Targets were connected, depicted in detail to employees and cascaded. These resulted in firms being placed in the top 5th percentile against the global average and within the comparison category, and in the 10th percentile against company size.

Talent management reflected the effort by managers to promote high performers and address poorer performers, in a balance between formal and informal processes. Managers in general displayed a less formal approach to talent management, but his did not negate a strong empathy and ethos to maintain a supportive and 'attractive' work environment where possible. Low turnover was observed in companies from all clusters with low annual turnover of 1-3% highlighted. Talent management scores placed firms on average in the 15th percentile against a global average and for the category for comparison, and in the 20th percentile against company size data.

Case Studies

Case Study

7. Case Study: BATZ

7.1 Back to its Roots: Mondragon

BATZ is a Basque company owned by the largest company in the Basque Country, *Mondragon*, Spain's 10th largest company. Mondragon is a Basque headquartered cooperative with companies also in Bizkaia in the Basque Country, founded in 1956. It is Spain's largest cooperative business group with a portfolio of autonomous cooperatives.[197] The Company operates in 41 countries, sells into a total of 150. It had revenues in 2015 of €12.1 billion from 261 businesses and cooperatives employing over 74,000 employees.[198] These are comprised of: 101 cooperatives; 128 subsidiary companies; 8 foundations; 1 benefit society; 13 umbrella organisations; 13 international services.[199] The Company is structured into four areas of operation: In*dustry, Retail, Finance* and *Knowledge.* Figure 10 depicts the employee distribution across these and within Spain and the Basque Country.

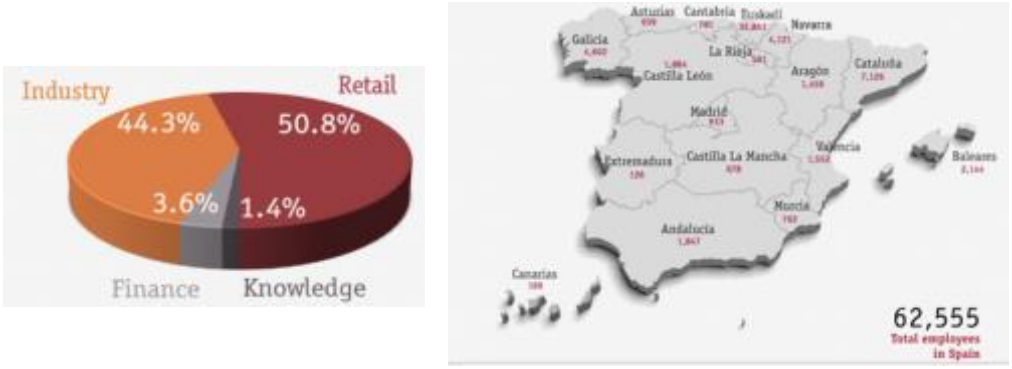


Figure 10: Mondragon employee split by Country, and Spanish and Basque Country employees
Source: Mondragon Corporation[200]

Eighty-four per cent of Mondragon's employees are located in Spain, whilst 44% are located in the Basque Country, reflecting its regional production focus.

7.2 Developing as a Co-operative

As a producer co-op, Mondragon and BATZ Group as a subsidiary company are owned by their members. Each member contributes to the co-op's capital when joining the Company and owns a share of the co-op as a result. The share is realised when the member leaves or retires. Each member is an owner of the co-op. Cooperatives in Spain enjoy specific rights. The Spanish government provides support in the form of 12.5-20% of the capital required by a new co-operative, at a fixed low rate of interest, and cooperatives paid no corporation tax for the first 10 years, and half the standard rate thereafter. Mondragon's co-operatives were also protected from foreign competition by import controls. Mondragon reflects the strong social ethos of cooperatives, acquiring and developing services and support for employees and the surrounding communities in which operating companies are located including savings banks; insurance co-op; medical and hospital co-op; schools and colleges, and a university with 4,700 students across 9 campuses.[201]

[197] http://Bizkaia.mondragon-corporation.com/eng/co-operative-experience/history/
[198] http://Bizkaia.mondragon-corporation.com/eng/
[199] http://Bizkaia.mondragon-corporation.com/eng/about-us/economic-and-financial-indicators/
[200] http://Bizkaia.mondragon-corporation.com/eng/about-us/economic-and-financial-indicators/employment-distribution/
[201] http://Bizkaia.solhaam.org/articles/mondra.html

7.3 BATZ Group

BATZ Group is part of Mondragon, and is a cooperative operating since 1963 in the Basque Country. It has major manufacturing operations in and around Bizkaia. It has revenues of €228 million and employs 1,600 people in 15 global locations in four businesses: Stamping Dies, Automotive Systems, Energy and Aerospace. The primary business is automotive, accounting for 71% of turnover, followed by Tooling (27%). Chart 17 depicts revenue and employee distribution by business type.

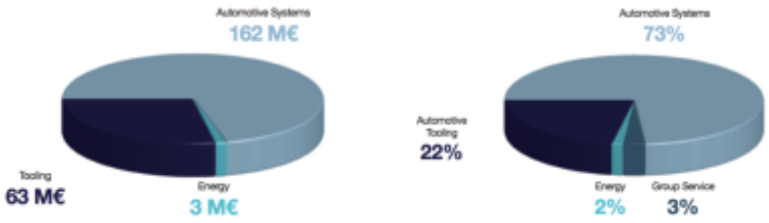
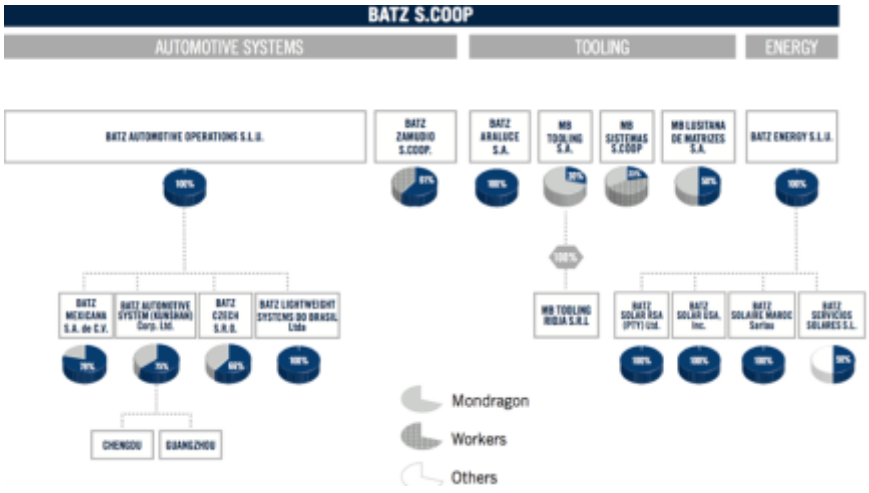


Chart 17: Batz Group turnover
Source: BATZ Group company information

Batz Group invests over 3% of turnover in R&D, and over €15 million on capex for the manufacturing implementation of R&D investment.[202] The major are of activity has been automotive to date, but by 2020, the Group is targeting revenues of €330 million, including energy and aerospace growth to €30 million and accounting for 2% of the total workforce. The four businesses include the following primary areas of activity with Figure 11 depicting the Group structure:

- *Automotive:*
  - *Tooling:* Designing and manufacturing automotive tooling.
  - *Automotive Systems*: Serial product manufacturing using engineering and production capacity globally to manufacture customer solutions from concept designs. 'Light & safe' systems are also offered through FPK, a company established in 1993 that joined BATZ Group. A specialty exists in the use of new materials & technologies for weight reduction for safety components.
- *Energy:* This is an emerging area, focusing on renewable energy, using core expertise in mass production to manufacture mirror holders and heliostat components for Concentrated Solar Power (CSP).
- *Aerospace:* A new area for the Group, with R&D activity undertaken in hot-forming technology with advanced alloys, targeting main aircraft manufacturers as customers to commercialise this.



[202] Company information and interviews.

Figure 11: Batz Group structure
Source: Batz company information

Batz Group operates in 15 countries, with automotive accounting for the majority of these activities. Figure 12 depicts the global footprint of the Business. This is primarily characterised by in-country wholly-owned manufacturing, with other additional activities undertaken in some countries such as sales, support, with agreements in place for other activities such as local manufacturing.

Figure 12: Batz Group international locations
Source: Batz company information

7.4 Automotive

The automotive business in Batz Group accounts for the majority of the Company's business. Ninety-five per cent of the current workforce is employed in this area in Tooling and Automotive Systems, and all but €3 million of the Group's turnover. The automotive business has established a market position in a number of specialties:

Tooling: Manufacturing using advanced materials such as boron steel and aluminium alloys, using cold and hot forming technology.

Automotive Systems: Specialisation on safety components with patented techniques for weight reduction and performance improvement through composite structural components. These serve to create aerodynamic benefits and weight reduction that reduce weight, fuel consumption and emissions for cars.

Batz Automotive works with major global customers on an EOM basis, with a head office in Bizkaia. The Company has expanded into other locations from its original base in and around Bizkaia, with manufacturing still undertaken in the Basque Country to supply customers. These components are subsequently exported or delivered as required to

customers. The global footprint for the Company can alter in due course depending on customer demand and business strategy.
Batz Automotive undertakes a spectrum of activities that are underpinned by a strong R&D investment and a culture of innovation to meet customer requirements. These include:

- Prototype manufacturing: The Company manufacturers prototypes to test product development and soft tooling design in stamping, welding, injection and assembly
- Validation and testing: Extensive in-house, external, and collaborative testing is undertaken including static and dynamic testing.
- Dies engineering: Process simulation is undertaken in addition to Dies design, and the manufacturing process that follows.
- Materials engineering: on-going development occurs in high strength steels and aluminium alloy applications, including developing and testing thin materials that provide high degrees of hardness and safety.

Batz Automotive recently celebrated its 50th anniversary in a competitive global business. The Company has retained is Bizkaia headquarters and a production base and its management is seeking to expand the business further. A review of the automotive business in Bizkaia including a plant visit and interviews with senior management, including the Group CEO, provide a deeper perspective on Batz Automotive's market position, plans and its practices.

7.5 Management Practices, Culture and Success

A review of Batz's Automotive operations in Bizkaia occurred in March 2017. This included visits to its Tooling and Automotive Systems facilities and discussions with a senior management team representing Manufacturing at multiple levels from Plant to Shift; Marketing and Internationalisation; Executive Management, including the Group CEO. During this time, and in remote discussions preceding the visit, the Automotive Businesses management practices were reviewed using the methodology developed by the LSE with McKinsey & Co and tested in over 20,000 interviews in 35 countries since 2007 (see the following section in this paper). As a co-op, Batz is characterised by a number of unique structural and cultural elements that when present in some other countries for comparable businesses can be an impediment to optimal management practices. In the case of Batz, the elements that can contribute to this did not appear to be strong, resulting in very strong management practices performance. This reflects stronger unique traits inherent in the Basque Country that can be 'intangible' in nature, but translate to tangible results.

Batz Automotive's financial performance has been strong with the Business profitable and securing capital both for direct Capex-driven expansion and further development through other international sales and agreement-driven effort. An aggressive growth plan is targeting turnover to increase by 45% between 2015-2020 to €330 million. This is likely to see production increase across existing plants and via agreements with 3rd party-manufacturers in some countries. In the longer-term this can result in additional plant expansion in new or existing countries.

Three areas of management practices were reviewed with the Business, reflecting the LSE the methodology utilised to measure these and depicted in greater detail in the following section on management practices: (1) Operations management; (2) Performance monitoring; (3) Target setting;

(4) Talent management. Utilising interview and review techniques, these were assessed and the results benchmarked against other comparable businesses globally.

Batz Automotive performed in the top 10% overall of all firms reviewed in the management practices research undertaken in the 10-year LSE study to date. This included the observation of best-practices in a number of key areas:

- Adoption of lean manufacturing
- Communication of daily production performance on the shop-floor
- Setting targets that reflect a variety of measurements- financial and non-financial
- Performance objectives 'stretch' the Business
- The Business proposition is attractive for people to want to work there
- Individuals are reviewed on performance and measures taken to address poor performance as well as to recognise talent

Although other companies assessed as part of this project in Bizkaia were not a co-operative, they shared a similar approach to talent management as Batz, reflecting a wider cultural factor present in the Basque Country. The key observations in the area of talent for Batz Automotive and other companies in Bizkaia assessed were:

- A greater degree of engagement to address poor performers, often with a longer window to address than normally observed in other countries.
- The co-operative charter of Batz limits the degree to which it can address poor performers when compared to non-co-operative firms, but this did not distinguish Batz from other companies in Bizkaia in the sample: all managers and production staff interviewed displayed a similar view towards talent and performance.
- A very low employee removal rate was reported in Batz and in all firms in the sample. A strong social culture existed with managers highlighting the extensive length they went to o address root-cause of any highlighted poor performance.
- Batz and all Bizkaia managers interviewed indicated that the incidence of poorer performers was very low. A number of explanatory factors were provided:
  - A greater reliance on local production teams to identify individuals performing poorer;
  - Addressing performance issues locally within their team;
  - Moving an individual between teams if required, or to another area;
  - Providing additional training if required to the individual;
  - The nature of the selection process
  - Knowledge of the Business by individuals who were predominantly drawn from the local area, and were familiar with its operations and expectations trough other employees;
  - The degree of training provided, or the development programmes employees undertook in the Business.
- A very strong social culture was evident in Batz, reflecting both its co-op nature and the wider culture observed in Bizkaia and the Basque Country. This promotes the role of the Company as a socially responsible entity that facilitates social development through employment and engagement with the local community. This is rarely observed in other developed markets.

Case Study

8. Case Study: LOINTEK

8.1 Overview

Lointek is a Bizkaia company engaged in the supply, manufacture and servicing of equipment for the petroleum refining, chemical, petrochemical, and renewable sources including solar thermal power and hydropower. The company employs over 300 people and has grown through acquisitions and organically, including acquiring companies that were operating since 1918. The Company has two main facilities in the Basque Country including its headquarters and workshops that cover 40,000 sqm, and facilities in the Port of Bilbao of 55,000 sqm for heavy equipment including manufacturing equipment up to 2000 tons, 150 m length and 12 m diameter. The Company has an engineering focus and a diverse energy cluster product portfolio:

Products

- Reactors
- Condensers
- Feed water heaters
- Heat exchangers
- Boilers
- Piping

Sectors

- Refineries & hydrocarbons
- Generation power plants
- Combined cycle nuclear
- Power plants upstream
- Process chemical plants
- Ammonia & urea
- Offshore
- Solar power plants

Turnkey Projects

- Steam generation systems
- Process systems
- Boilers
- Piping

The products offered include:

- Pressure vessels, reactors and columns; including their integration in the different processes of the installation
- Steam Generation Systems: Solar Thermal Plants and Industrial applications
- Feedwater preheaters of High Pressure and Low Pressure
- Surface Condensers
- Tube -shell exchangers with high performance
- Oil to Salt Heat Exchangers
- Boilers:
  - Industrial Boilers
  - Heat thermal fluid (HTF) boilers
  - Waste heat boilers (WHB)
  - Cogeneration boilers. Heat recovery steam generator (HRSG)
  - Fire-Tube Boilers
  - Gland steam boilers
- High pressure piping systems; A335P91, A335P22 and A335P11
- Modular systems (Onshore – Offshore)
- Piles and transition pieces Offshore

The Company has a world leadership position in solar power plants; manufacturing condensers and feed water heaters (FWH); manufacturing reactors, boilers, HRSG; manufacturing heat exchangers Lointek also offers equipment design and supply services including:

- Technical and financial feasibility studies
- Turnkey projects
- Basic and detailed engineering. Thermal and mechanical design
- Gathering raw materials, manufacture and equipment supply
- Project management
- Commissioning and personnel training
- After sales service
- Performance optimisation studies. Energy and systems optimization
- Repair and revamping of boilers

The Company has offices and facilities in 3 countries including Bizkaia (HQ and Heavy Industries), USA (Houston), and Mexico. Lointek has a presence in 32 other countries spanning multiple continents.

8.2 Products and Services

Oil and Gas: The supply of pressure equipment for this segment including the design and manufacturing of critical items for high pressure/temperature processes for hydrocracking, hydrotreating, desulphurization, gas treatment and polymerization processes, in the petroleum refining and petrochemical industry. A wide range of materials are utilised including Cr-Mo-Vanadium steel and weld overlays of austenitic steels.

Chemicals and Petrochemical Industry: Manufacturing of fertilizers including the design of equipment for use with components utilising ethylene, propylene, detergents, and resins. Production of ammonia and urea undertaken. Manufacturing of critical and long lead equipment including heavy wall, hydrocracking, hydrotreating, EO reactors; shell and tube heat exchangers; High Pressure/Low Pressure feed water heaters; waste heat boilers; steam drums; condensers, and other equipment. Critical equipment manufactured including secondary reformers, gas-gas heat exchangers and distillation columns, strippers, carbamates condensers and scrubbers for urea.

Energy- Conventional and Renewable: R&D activities are undertaken in solar thermal power with generation plant systems, with a leading position in the global market in this niche encompassing technology development, design and manufacture of this type of systems. This encompasses the design and construct of equipment in the water-steam cycle of a power plant including solar thermal plant equipment with intermittent operation and

aggressive cyclic loads that require a specialised design. Other equipment supplied includes heat exchangers required as feedwater preheaters (high and low pressure), steam generators, superheaters, and reheaters.

More advanced solar plants with a heat storage system utilising molten salts are also supplied to generate electricity during low solar periods, including the design and supply of heat exchangers that transmit accumulated energy to the HTF system. A spectrum of activities are undertaken including engineering, design, manufacture, installation and commissioning of Steam generation systems, including a turnkey solution of the Power Island.

Boilers –Industrial: Customised steam generation solutions are manufactured for the chemical and petrochemical industries and power generation industry from the design, manufacture, and installation of boilers and auxiliary elements for a turnkey solution. Production includes the fuel feed system, ducts, fans and other equipment in the flue-air system; electrical and I&C installations, auxiliary piping of steam and water. Solutions are customised and delivered from Port of Bilbao facilities either completed or partially assembled.

Offshore: The design and manufacture of pressure equipment for processing plants and modular systems for the Oil & Gas cluster and structural components for the offshore wind energy segment. Designs are created with products delivered turn-key for installation directly from the Port of Bilbao to a cargo ship. This include piles and transition components for the offshore wind energy cluster.

8.3 Management Practices

Lointek's management displayed strong overall best-practices using the LSE-McKinsey methodology, in all four areas: Operations Management, Performance Monitoring, Target Setting and Talent Management. This positioned the Company in the 5th percentile against global results and in the >250 employee category, reflecting a number of best practices, cultural elements, and attributes:

- Modern manufacturing principles were introduced to support business objectives, versus being reactionary;
- Performance was monitored, tracked, and teams addressing issues as they arose;
- Targets were set in a cascading manner from high level objectives in a mix of financial and non-financial targets;
- A longer term view was taken with targets;
- Open communication occurred in the Company for plans, objectives and team engagement;
- Employee evaluations occurred to capture performance, aspirations and development;
- Talent management was proactive to reward and develop employees and a proactive work culture.

Lointek's management practices scores were consistently high across all four areas observed, with each area ranking in the top 5th percentile, contributing to its overall position in this band. Additional practices have contributed to the Company's success:

- R&D investment occurred on a consistent basis;
- A high number of skilled employees in engineering, industrial design and related area;
- A strong culture of innovation existed throughout organisational levels to encourage individuals to strive for improvement in processes;
- Formalised appraisal process for employees and managers;
- Strategic locations: Port of Bilbao and Bizkaia in the Energy Cluster;
- Leading customer base internationally and within Bizkaia, Basque Country, Spain,

These and core management practices have contributed to Lointek's market leadership in some sub-segments such as Solar, and brought additional recognition: in 2017, Lointek Heavy Industries received the *ON Bizkaia 2017 Prize* for a spin-off company, recognising its new business in the 55,000 sqm site at the port of Bilbao that manufactures heavy equipment and can load this directly on cargo ships, contributing to Bizkaia's exports and strengthening Lointek's international position. The awards were presented by Unai Rementería, General Deputy of the Regional Government of Bizkaia, Imanol Pradales, Regional Councillor for Economic and Regional Development, and other industry representatives, bringing together 400 businesses for the sixth Bizkaia Business Conference and the ON Bizkaia 2017 awards ceremony.[203]

[203] http://Bizkaia.lointek.com/wp-content/uploads/2017/02/NP_Premio_LOINTEK_2017_02_21_en.pdf