AN INTEGRATED DASHBOARD FOR THE CERAMIC SECTOR BASED ON BIG DATA BUSINESS INTELLIGENCE

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1. INTRODUCTION

Business Intelligence has become an important area of study for both professionals and researchers, which reflects the magnitude and impact of the data-related problems needing to be solved in modern business organisations (Chen, Chiang and Storey, 2012). Information about the business environment changes rapidly over time, and thus generating information and knowledge from raw or non-debugged data from databases is vital to business decision-making (Liu, Li, Ruan and Zhang, 2011). In addition, the constant application of new information technologies, with a greater or lesser intensity, is often speeding up these changes, forcing companies in turn to develop more flexible structures to deal with the new economic and market scenarios with a minimum guarantee of success.

Many studies have highlighted the importance that both Business Intelligence and Big Data have in large companies, but the reality that surrounds us, not only in Spain but also in the rest of the world, is that 98.5% of companies are small and medium-sized ones (Orbis, 2015). This issue can also be extended to the Spanish ceramic sector, where, of the 278 companies listed in Orbis (2015) in Section 2331 Manufacture of ceramic wall tiles and floor tiles, 140 are small, 70 medium, 63 large and only 5 are classified as very large.

Today both small and medium-sized companies, and not just large ones, have the possibility of accessing strategic up-to-date information on how the ceramic sector and other related sectors such as construction are evolving. When referring to the fact that information is updated, we refer to the frequency with which data is collected and classified. For example, in the case of the database of the European Statistical Office, better known as Eurostat, in the middle of every month it provides detailed information on international trade with only a two month time-lag. That is, in May it provides the March information on international trade, both on imports and exports, for all the countries of the European Union with Europe and with the rest of the world.

In short, we should point out that companies are in a constant state of alert, observing, listening to or reading trends, tips and recommendations about the importance of the data and its proper use. Information has become a commodity with a growing value, where companies need to know how to invest relentlessly, and in addition, need to make proper use of it if they want to survive the changes imposed by time and changing societies. Its availability, usability and applicability will make the difference between success or failure, the survival and even the growth or the closure of companies. It is precisely in this last point, its usability and exploitation, that one of the most relevant success factors in this regard lies. The use of algorithms is precisely where the real value of big data will lie, in their ability to obtain valuable information in time, and in the way they help in making decisions and with the actions arising from these.

Moreover, the creation of a dashboard by ceramic companies has helped their management by means of a series of key indicators for the business or KPIs (Key Performance Indicators) that facilitate decision-making and control. In general this dashboard sets out these indicators in a clear and useful fashion, in such a way that their evolution can be observed over time, and important decisions taken with a substrate of valuable information.

From this perspective, and combining these two factors, the basic goal of this study is to offer the ceramic sector an overview of how, in a clear, practical and sequential way, step by step, their small and medium-sized companies can apply the concepts of Business Intelligence and Big Data, in order to develop a dashboard that is updated monthly via open information sources, thereby allowing these companies to improve the knowledge of the market and make strategic data-based decisions with a high level of reliability.

2. METHODOLOGY

The methodology pursued in this study focuses on extracting information about international trade from the Eurostat website (http://ec.europa.eu/eurostat), this information being found in particular in the following link:

http://ec.europa.eu/eurostat/data/database

In the above link, the user has to click on International trade, as shown in Figure 1.

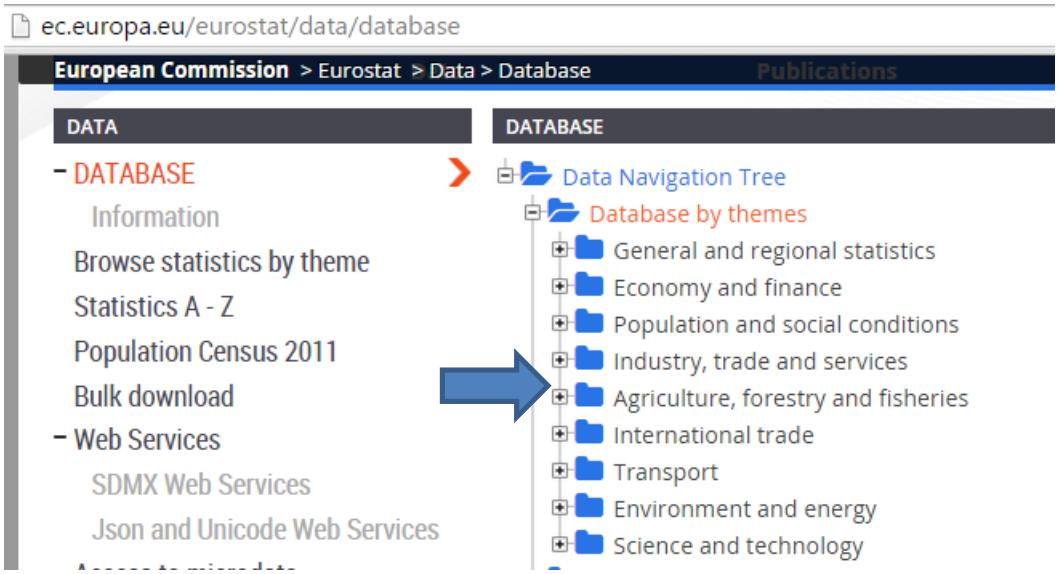


Figure 1. *Eurostat database (i).*

This then allows the user to enter the section entitled *International trade detailed data (detail)*, (Figure 2).

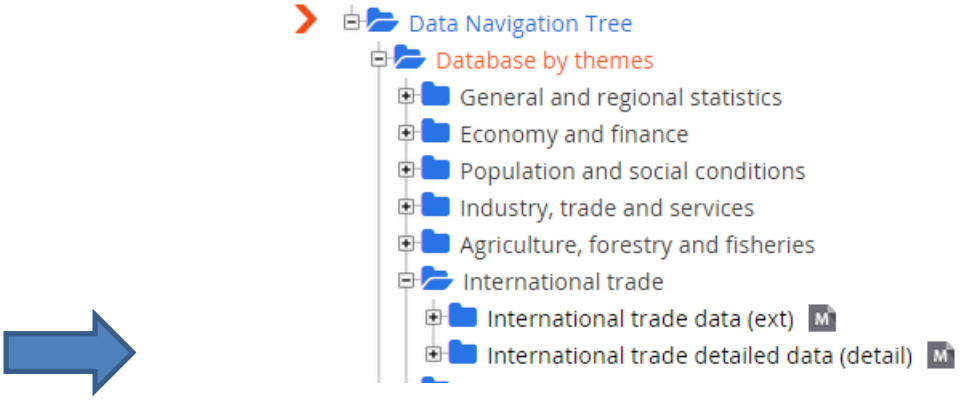


Figure 2. *Eurostat database (ii).*

Performing the above action opens a pop-up where the user can enter in order to analyse the international trade in a particular product on the basis of its taric code. Figure 3 shows the different alternatives existing, such as for instance the option on

EU trade since 1988 by CN8, with the 8 at the end indicating the detail of the taric code offered by Eurostat.

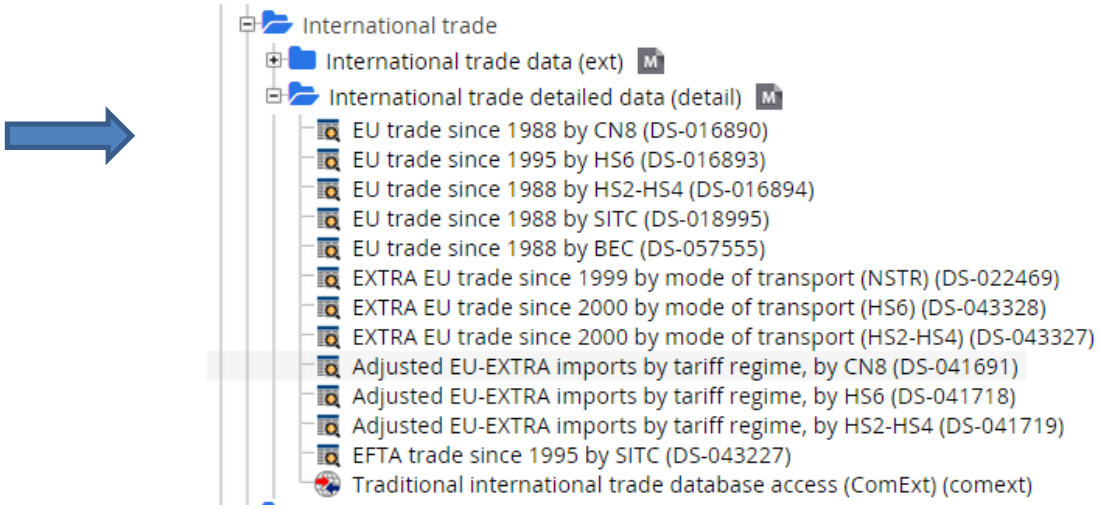


Figure 3. *Eurostat database (iii).*

The previous section will be the one of interest for our analysis, since the most frequently used taric codes in the ceramic sector are the eight digit ones. Thus, for example:

6908 refers to " glazed ceramic flags and paving, hearth or wall tiles: glazed ceramic mosaic cubes and the like, whether or not on a backing":

6908.90 – Other types –– Ordinary clay:

6908.90.91––––– Stoneware.

In particular, 6908.90.91, includes glazed stoneware tile: stoneware floor tile and porcelain stoneware tile. In addition, this example will be used in the data analysis section where a dashboard is developed for SMEs.

These taric codes can be found in the BOLETÍN OFICIAL DEL ESTADO (Official State Gazette) for Friday, December 31st 2004, SUPPLEMENT NUMBER 315. RESOLUTION of December 17th 2004, of the Department of Customs and Special Taxes of the State Tax Administration Agency, which updates the integrated tariff application (TARIC).

https://www.boe.es/boe/dias/2004/12/31/pdfs/C00001-00775.pdf

Continuing with the implementation of the contents of the database, Figure 4 shows the information provided by Eurostat on international trade.

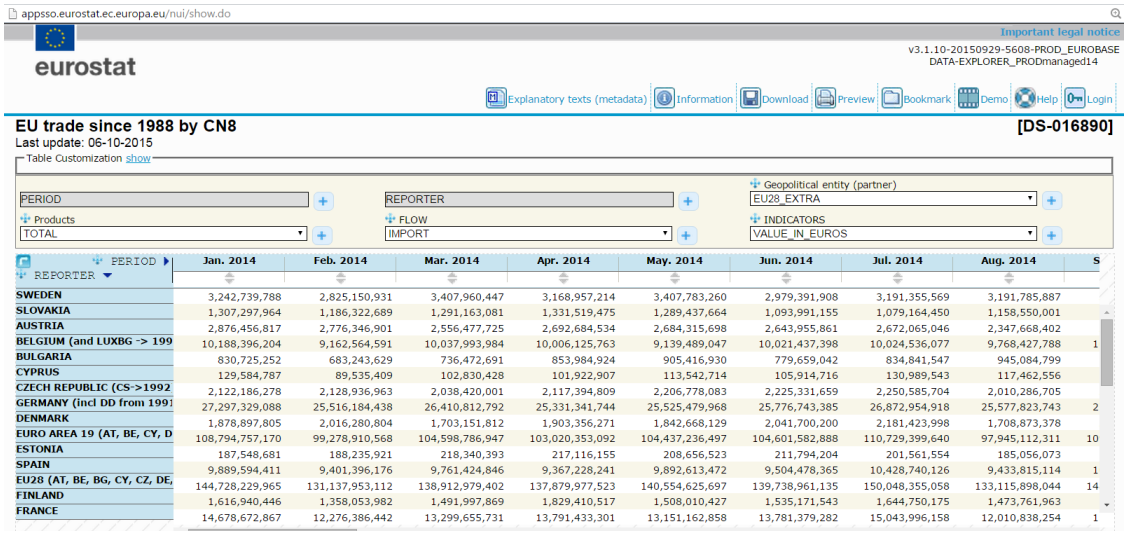


Figure 4. *Eurostat database (iiii)*

In this case, the first thing is to select the period of time that we wish to analyse (Figure 5). At this point, it is essential to bear in mind the great value of the information provided, since this appears on a monthly basis and not added each year, which makes it possible to have a large amount of information available for business decision-making in the short term. As we have indicated in the introduction to this work, the information appears with a two to three month time lag, i.e. at the time of preparing the study, at the end of September 2015, information was available for June-July 2015.

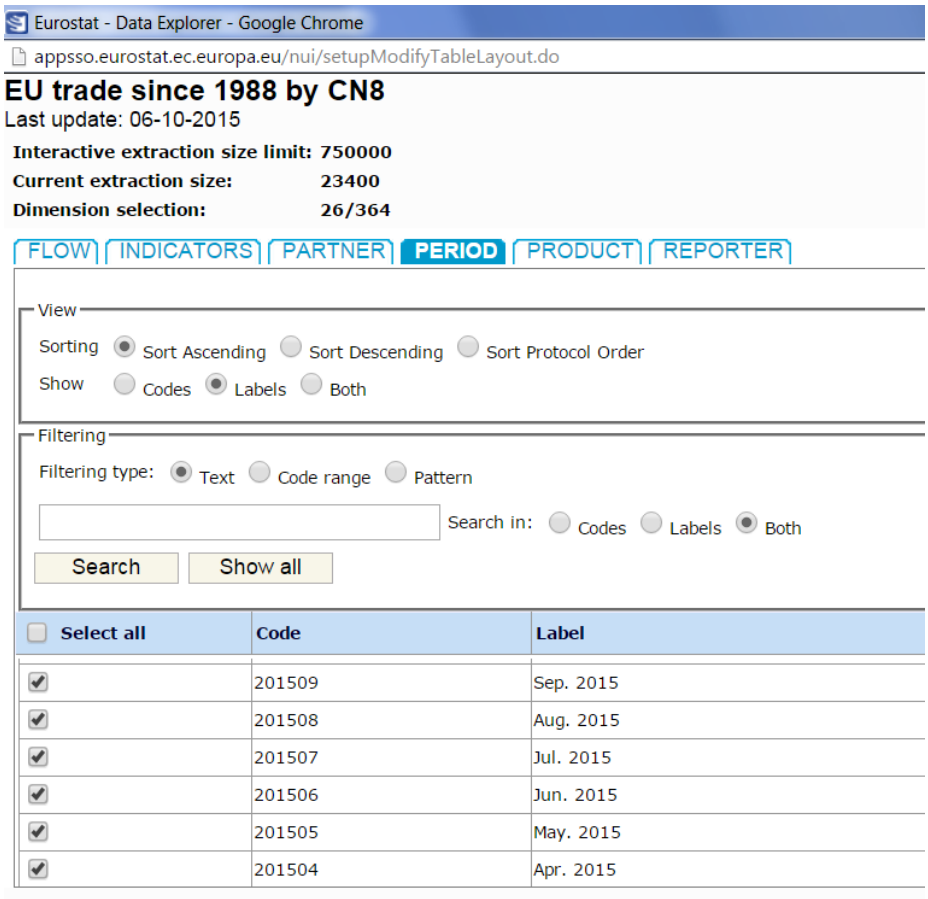


Figure 5. *Time-based selection of the Eurostat information.*

The next step is to select the flow, whether imports or exports. In our case we will analyse exports (Figure 6).

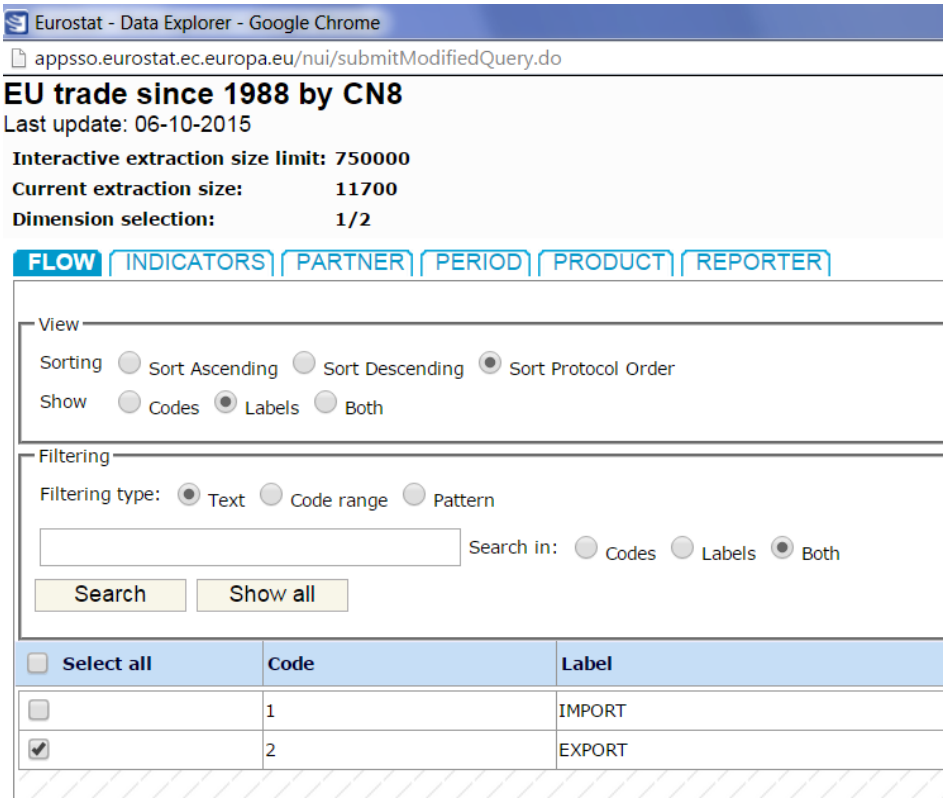


Figure 6. *Exports-imports.*

The next step is to select the indicators or KPIs relating to weight and economic value. It is important to select two values, since dividing between the value in euros and kilograms makes it possible to determine which countries are those buying the most expensive square metre (Figure 7).

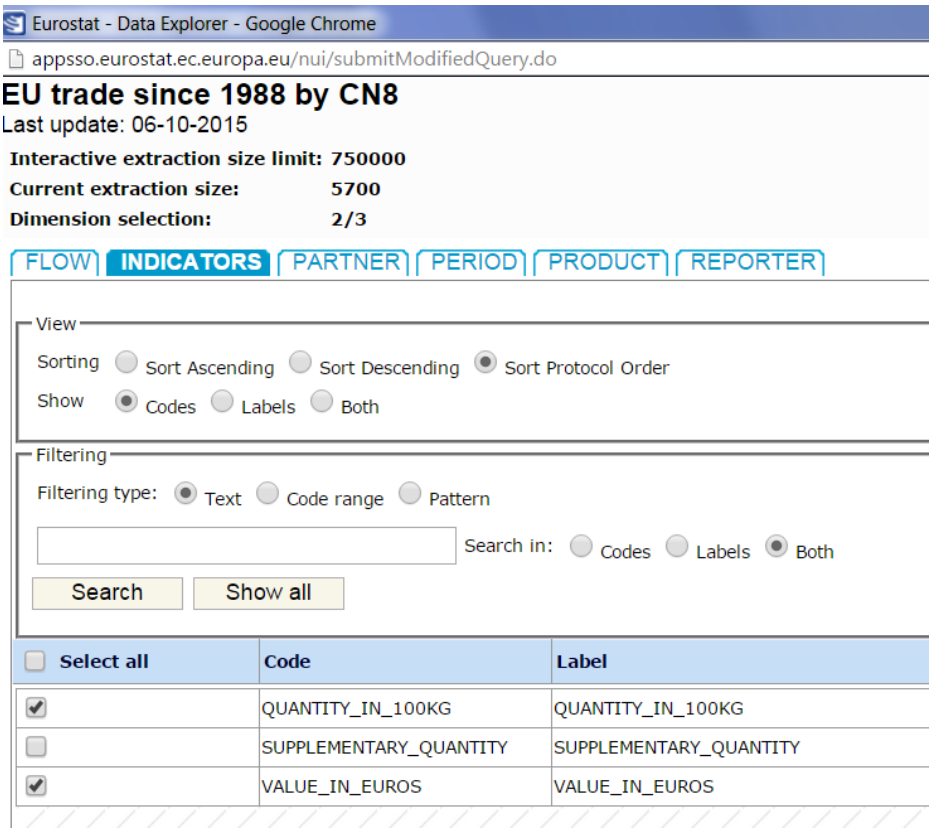


Figure 7. *Indicators.*

We can then select the countries of the world for which we wish to analyse the exports of ceramic products. For example in this case, we will analyse the markets of Germany, France and the United States (Figure 8).

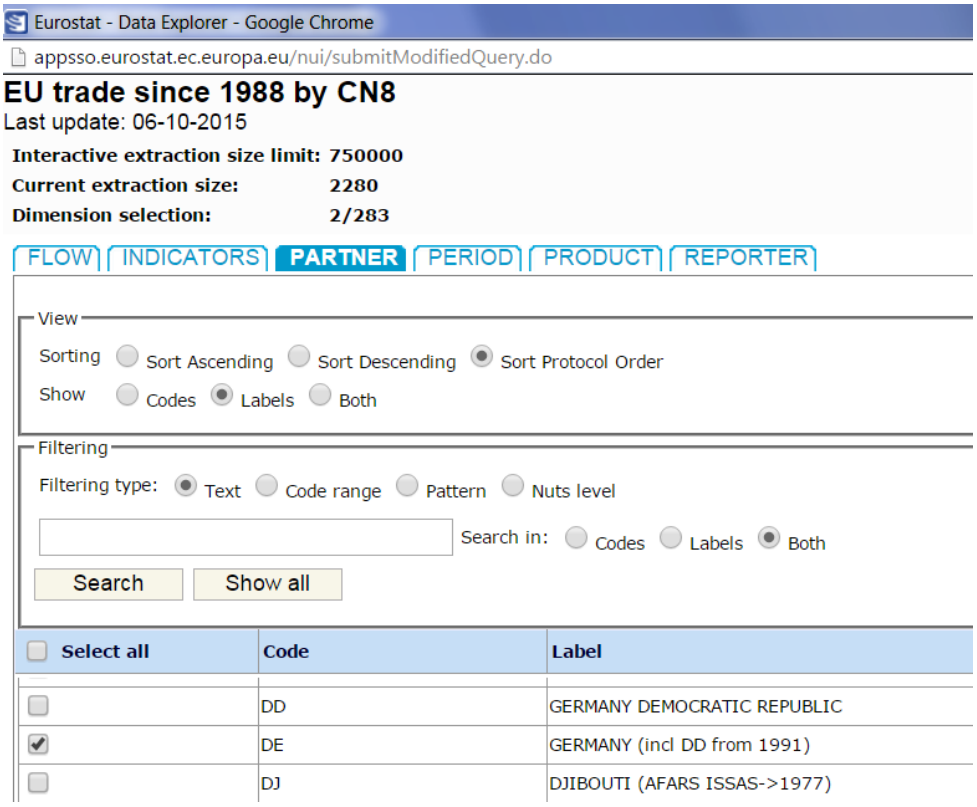


Figure 8. *Product destination countries.*

As indicated previously, the product can be selected according to the taric codes (Figure 9).

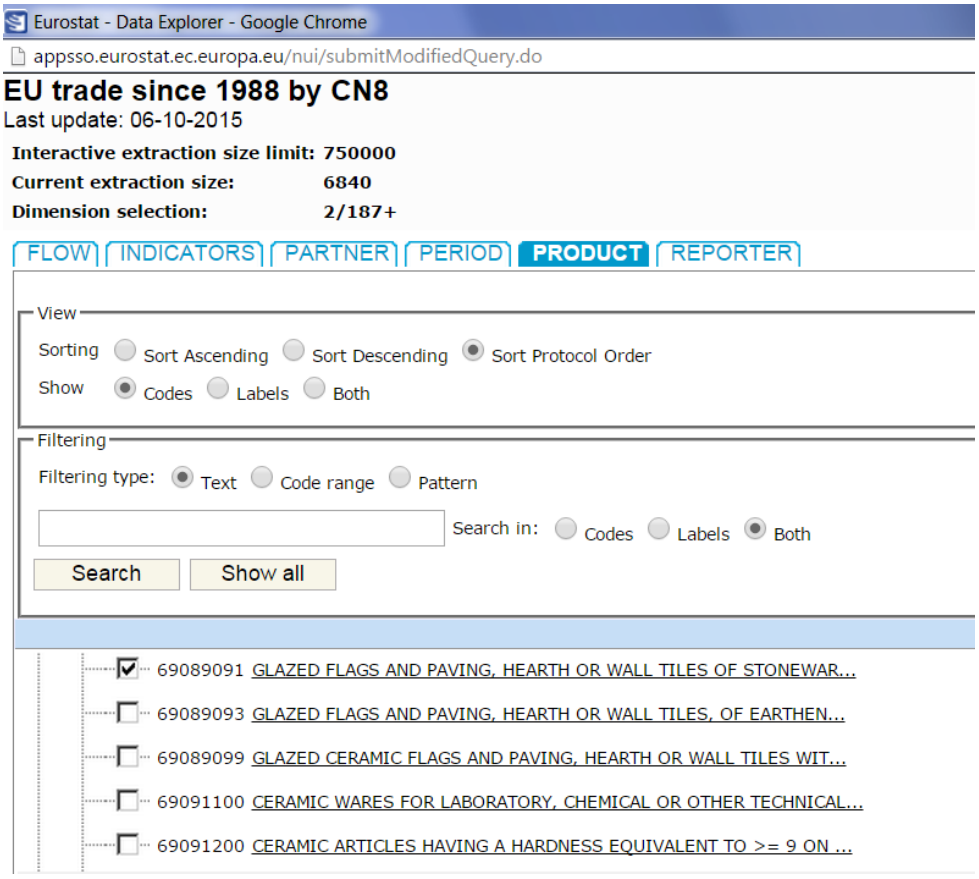


Figure 9. *Product selection.*

Lastly, the country of origin needs to be selected. It is important to note that unlike DATACOMEX, with Eurostat we can analyse all the European countries, and in this way Spain can be compared with Italy, as we shall do in this study (Figure 10).

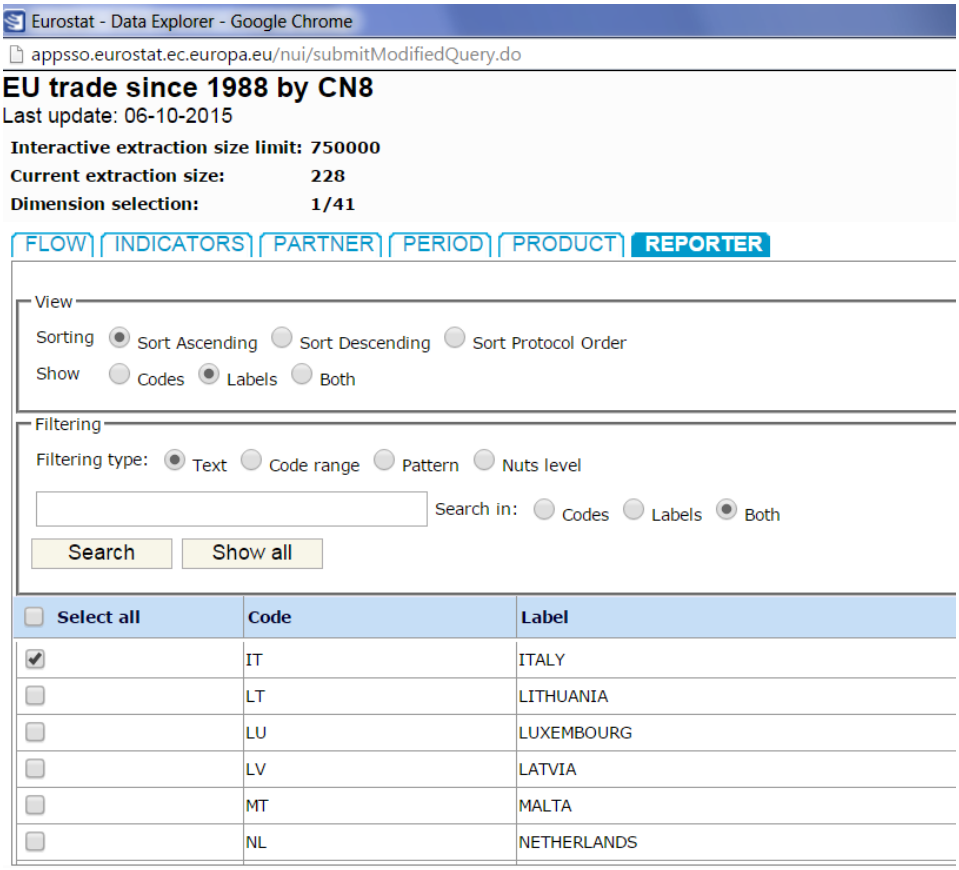


Figure 10. *Countries of origin of the exports.*

Once the previous sections have been selected, click on update to display the requested information (Figure 11).

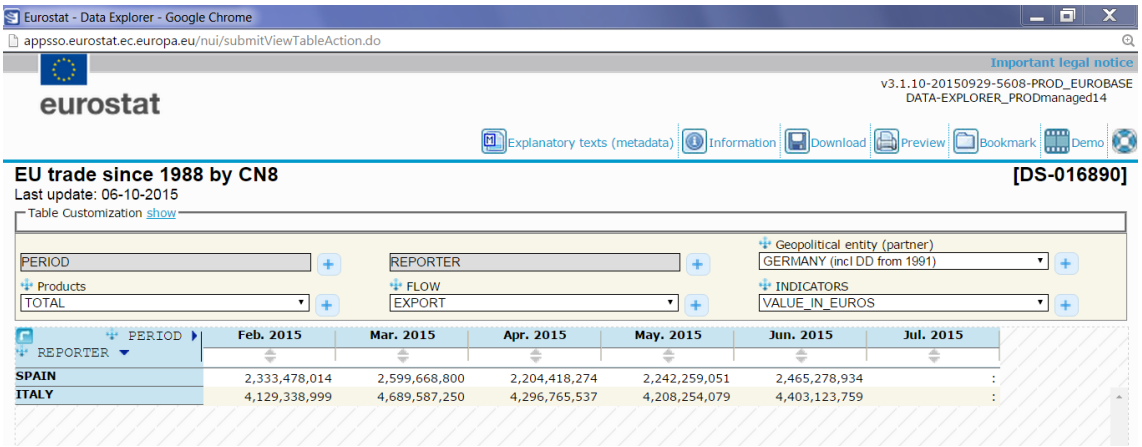


Figure 11. *Information provided.*

This information can be downloaded in Excel format by pressing Download. With this information, we will be able to proceed with the analysis (Figure 12).

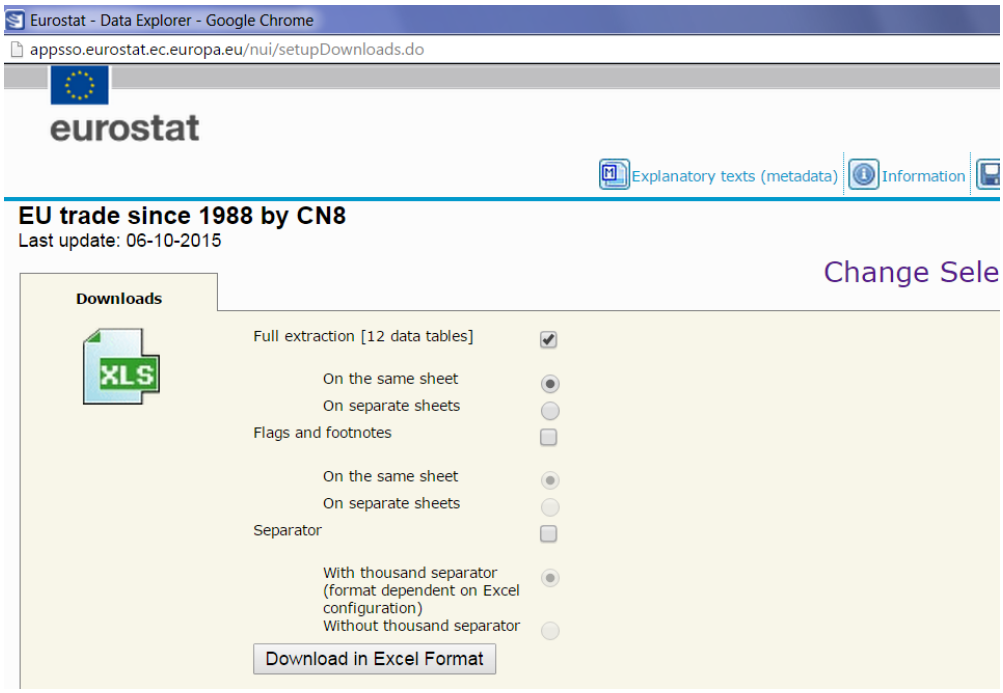


Figure 12. *Data download.*

3. DEVELOPING A DASHBOARD FOR SMEs

The aim of this section is to transform the downloaded data into information and knowledge, facilitating decision making in companies and in particular in SMEs, since, in general, they do not have large marketing departments to analyse this information.

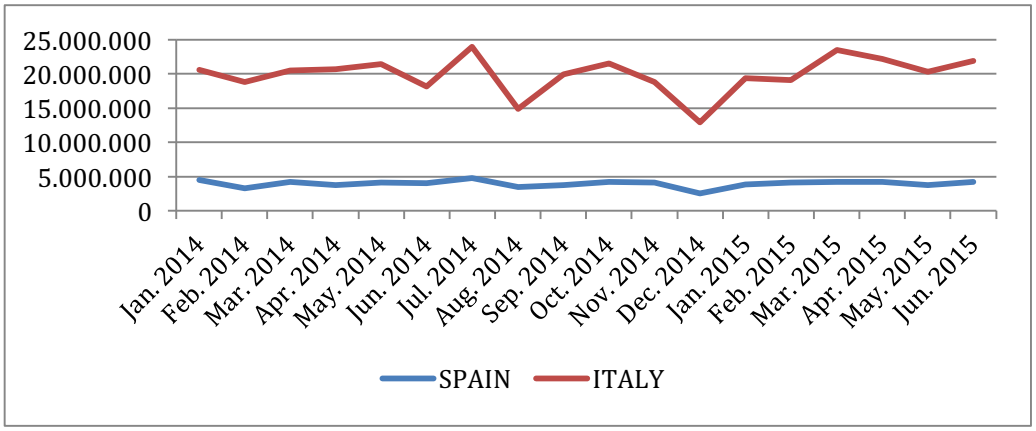
In this sense, according to that extracted from a recent study (Forrester, 2015) companies have significant problems in managing the volume of information that reaches them properly. According to this study, 60% have diverse problems in information management, 48% are dissatisfied in the way they receive the data and have access to it (access speed), and 56% with the confusion generated by being unable to obtain or have a single view of the contents of multiple sources of data. Delving deeper into this situation, 59% say they feel frustrated and confused with the diversity of platforms that provide or can provide them with data, in addition to 54% that feels the same way about the disparity of metrics used by the various consultants, institutes and observatories with their studies to analyse the data and obtain more clarifying conclusions.

To be able to start out with a series of more or less agreed premises, it is first of all necessary to highlight the fact that for the data obtained to have value, it has to be updated periodically and continuously. In the case of Eurostat, updating its data on a monthly basis makes it possible to gain competitive advantages and find niche markets with regard to the competition.

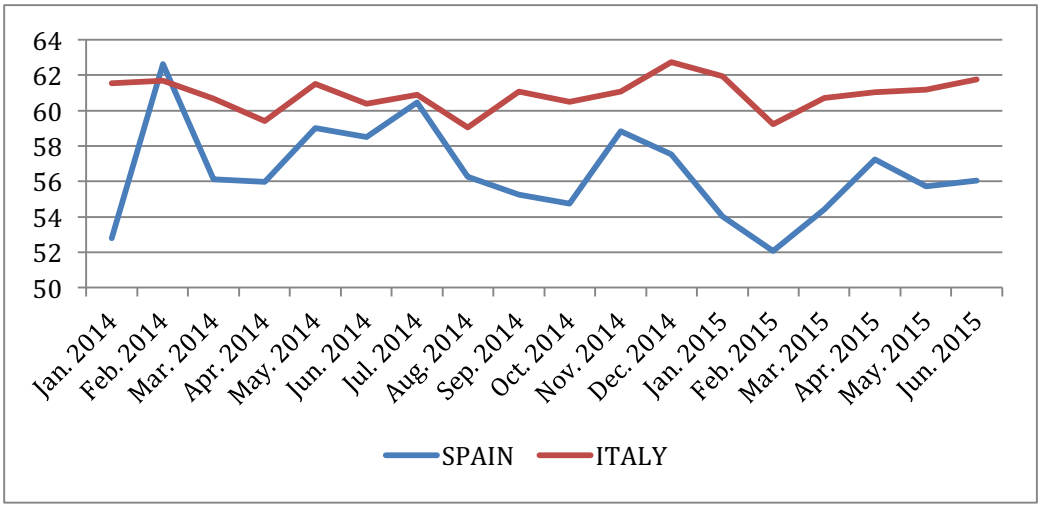
In addition, for the correct development of a dashboard, the sales performance of the company in the different countries analysed has to be compared with the evolution of exports to those countries, thus determining, for example, whether a

decline in sales in the company is in tune with an overall decline in exports which would justify such a drop.

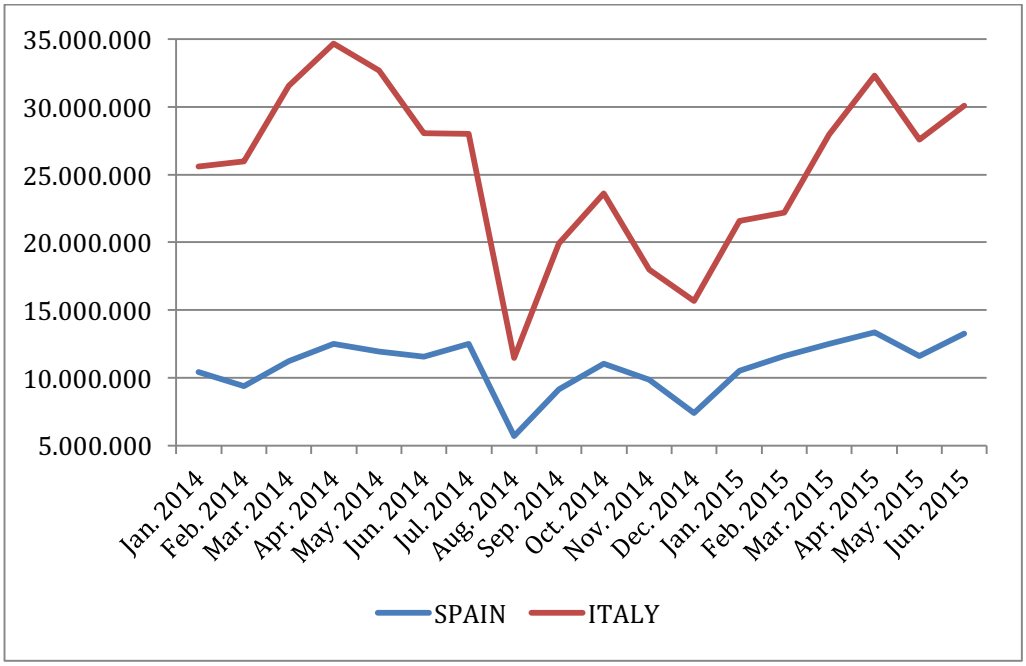
By way of example, we can see in Graphs 2, 3, 4, 5 and 6, how the evolution of exports and their value is analysed for the markets in Germany, France and the USA.



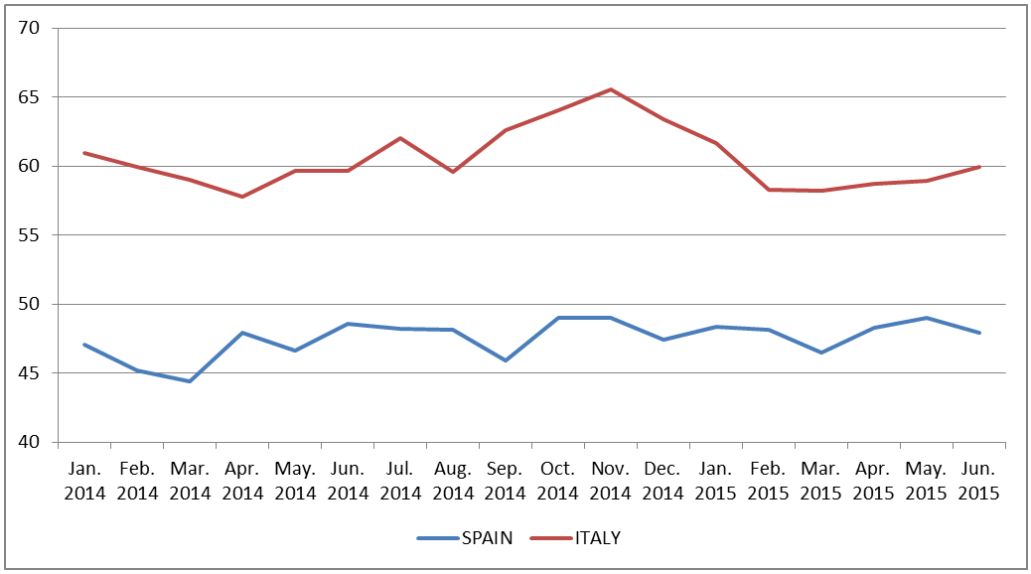
Graph 1. *Evolution of exports to Germany (in euros).*



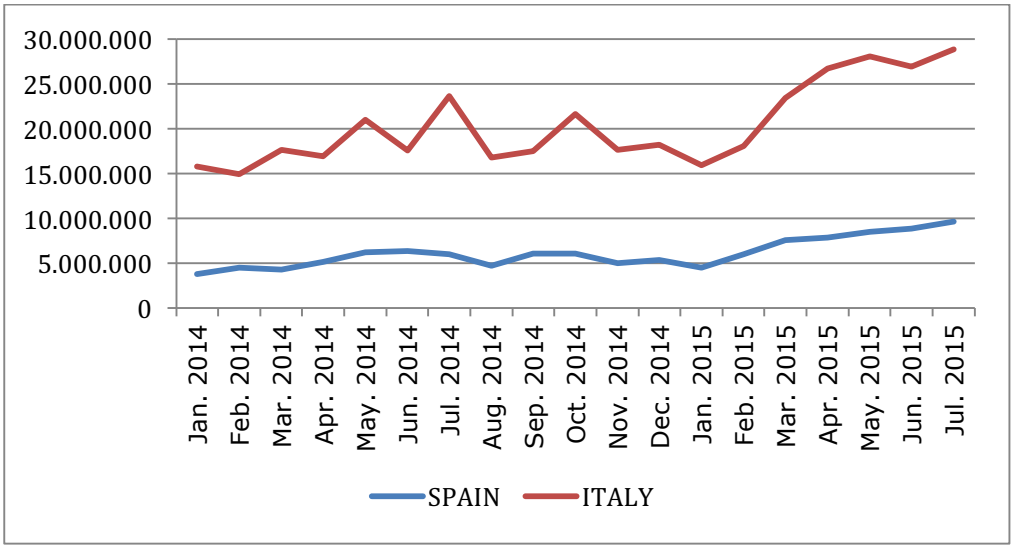
Graph 2. *Evolution of the value of exports to Germany (euros/100 kg).*



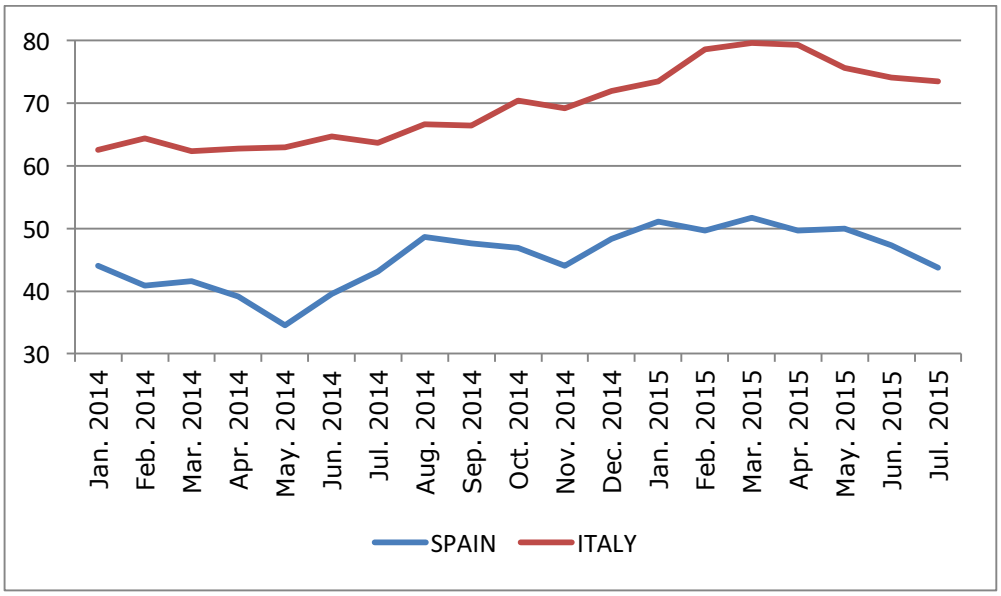
Graph 3. *Evolution of exports to France (in euros).*



Graph 4. *Evolution of the value of exports to France (euros/100 kg).*



Graph 5. *Evolution of exports to the U.S. (in euros).*



Graph 6. *Evolution of the value of exports to the U.S. (euros/100 kg).*

It may prove difficult to make decisions with the above data, therefore companies need to analyse data in a more detailed way. To do so the evolution of the markets is taken in a month compared to the same month of the previous year (t/t-12) and from a month earlier (t/t-1), and in this way the data are much easier to analyse and a dashboard can be generated that allows strategic decisions to be taken, as can be seen in Tables 1, 2 and 3 for each of the countries or markets analysed.

	June 2014	May 2015	June 2015	t/t-12	t/t-1
Euros					
Spain	4,008,817	3,792,931	4,176,860	4.19%	**10.12%↑**
Italy	18,121,383	20,348,041	21,936,486	**21.05%↑**	7.81%
Amount (100 Kg)					
Spain	68,501	68,050	74,502	8.76%	9.48%
Italy	300,109	332,562	355,251	**18.37%↑**	6.82%
Euros/100KG					
Spain	59	56	56	**-4.20%↓**	0.59%
Italy	60	61	62	2.26%	0.92%

Table 1. *Dashboard for Germany.*

	June 2014	May 2015	June 2015	t/t-12	t/t-1
Euros					
Spain	11,543,351	11,588,800	13,251,931	**14.80%↑**	**14.35%↑**
Italy	28,047,960	27,567,218	30,069,514	7.21%	9.08%
Cantidad (100 Kg)					
Spain	237,687	236,307	276,475	**16.32%↑**	**17.00%↑**
Italy	470,202	468,027	501,935	6.75%	7.24%
Euros/100KG					
Spain	49	49	48	-1.30%	-2.26%
Italy	60	59	60	0.43%	1.71%

Table 2. *Dashboard for France.*

	July 2014	June 2015	July 2015	t/t-12	t/t-1
Euros					
Spain	6,050,866	8,885,601	9,627,017	**59.10%↑**	8.34%
Italy	23,686,022	26,966,910	28,830,828	**21.72%↑**	6.91%
Cantidad (100 Kg)					
Spain	140,256	187,623	219,896	**56.78%↑**	**17.20%↑**
Italy	371,873	364,076	392,629	5.58%	7.84%
Euros/100KG					
Spain	43	47	44	1.48%	-7.56%
Italy	64	74	73	**15.29%↑**	-0.86%

Table 3. *Dashboard for the U.S.*

4. CONCLUSIONS AND IMPLICATIONS FOR MANAGEMENT

In the information society in which we live, the proper management of this information has become a key success factor for companies, which has caused many of them to compile it actively and passively by contracting companies specialising in it, or by using computer tools and internet content searching applications, thereby managing such activity within the company. All this information means that collecting and processing it in order to convert it into data that is useful for companies is suffocating them due to an excess of information. And not only the companies as such but also the brands themselves, although they are fully convinced of the potential and the usefulness of big data, also worry about how to handle all the information they receive properly, effectively and efficiently, and how to access and manage that which they don't have and need, which is a major challenge. According to a recent study by Forrester (2015) companies have a major problem when it comes to managing information, and treating and distributing data that is useful and classified for the various departments.

However, and according to what has been shown in this article, SMEs can access sources of reliable and up-to-date information for decision-making. We have also seen how the data obtained from the various information sources should be analysed and treated in a suitable and innovative way in order to aid decision-making, and in this way obtain information that is valuable for companies' governing bodies when it comes to making decisions. When too much data is handled in an overall way, it may make it difficult to take strategic decisions. For this reason, considering a number of simple indicators in a dashboard can be useful for managers.

The frequency with which their content is updated and analysed is also a key factor for success. In the case of Eurostat analysed in this study, the information must be analysed and updated monthly to enable the opportunities and threats in the market to be identified. In this sense, and by analysing the information analysed by the supply side more carefully, the data included in the analysis can be extended to other European countries which would allow competitors to be monitored continuously. But also on the demand side, it is possible to consider all the countries in the world in order to identify those countries where growth in demand is occurring.

In this way, the competitive environment and new market opportunities can be analysed together and in an integrated way.

Also from a strategic point of view, for all the data from information sources such as Eurostat, each company should compare the overall performance of the market with their own performance in each of the countries in which they operate or to which they export. In this way, they can obtain a more real insight into their true market situation in the international context.

In this sense, for example, previous data can be analysed and compared to key macroeconomic data such as each country's GDP. The importance of including GDP in the analysis is because a host of international organizations (EU, OECD, World Bank, etc.) tend to make forecasts based on this variable, which also allows them to make forecasts about the markets that are of interest to the company by combining data on exports with that on the GDP.

In terms of future trends, recent success stories of companies that are taking advantage of the pull of big data are linked not only with the information they possess, but also with the usefulness to be gained from its proper use. Examples like Amazon, whose success in this regard is not based on the huge amount of data it receives from consumers, but on the powerful tool of the recommendations deriving from that information and that are displayed on the platform with every search or inquiry that takes place, can suggest to us how we might use internet users' search browsing information with our website, for example. Or the case of Netflix could also help us, since this firm not only knows a lot about what consumers are seeing when they browse their site, but has made it into a driving force designed to push them towards viewing more content. Once again, the value of the suggestions related to the visitors' search behaviour can help to guide them on this journey and in their decision-making, which can redound to the benefit of the ceramic company.

In the very near future therefore, companies will be evaluated not only on their data, but also by the way in which they obtain and analyse it, in such a way that the algorithms that convert this data into actions will become the secret ingredient of the companies' success and their way of improving relations with their customers and the market in general. Ceramic companies will have to continue digitising a part of their business and making it compatible with their offline business. The management of the companies and their brands will be carried out jointly and in an integrated way, and in order to do so big data is, and will be, crucial.

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