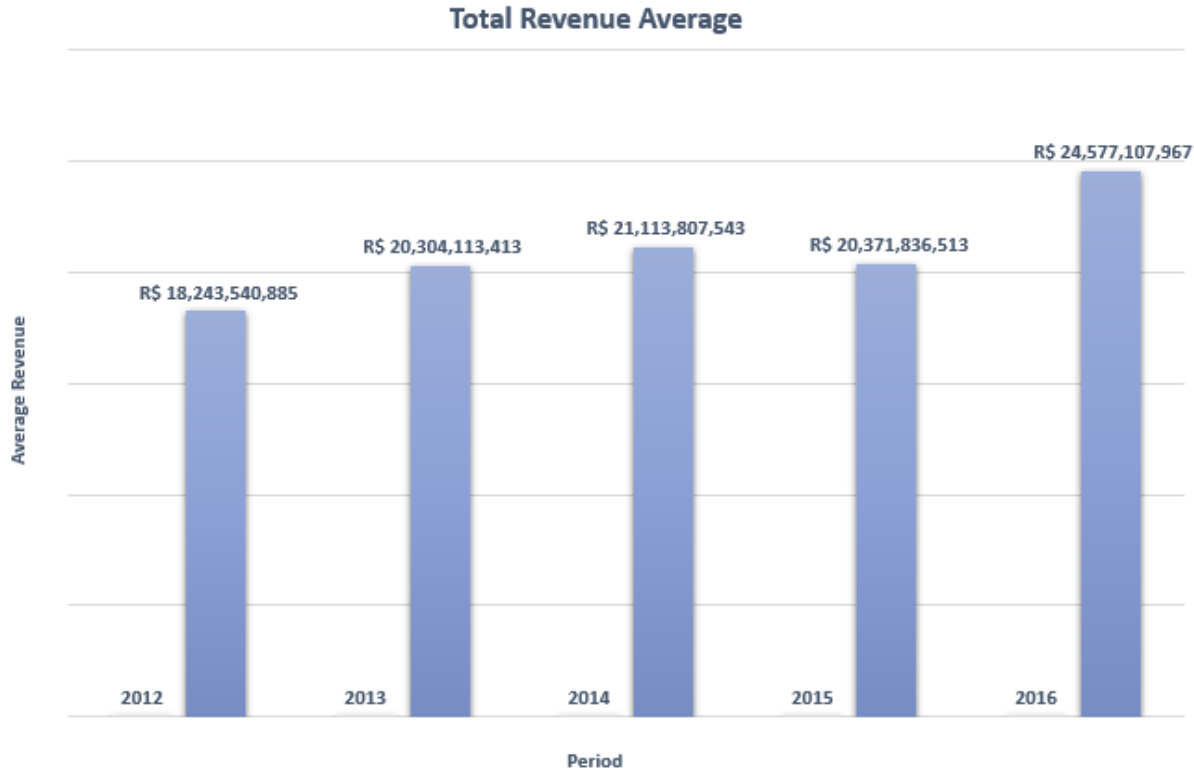


S&P 500 Analysys

Following below a business analysys of the S&P 500 Companies. Our focus here it's to analyze how the revenue of the companies behaved over the years, also we would like to guide you to answer a very important question: "Is it worth investing in R&D?"

The Data we are working on includes data from 2012 to 2017. Many analyzes presented here only include data from 2012 to 2016, many of the data from 2017 are not complete, and may generate errors in the analyzes performed.

What is the revenue average in each year ?

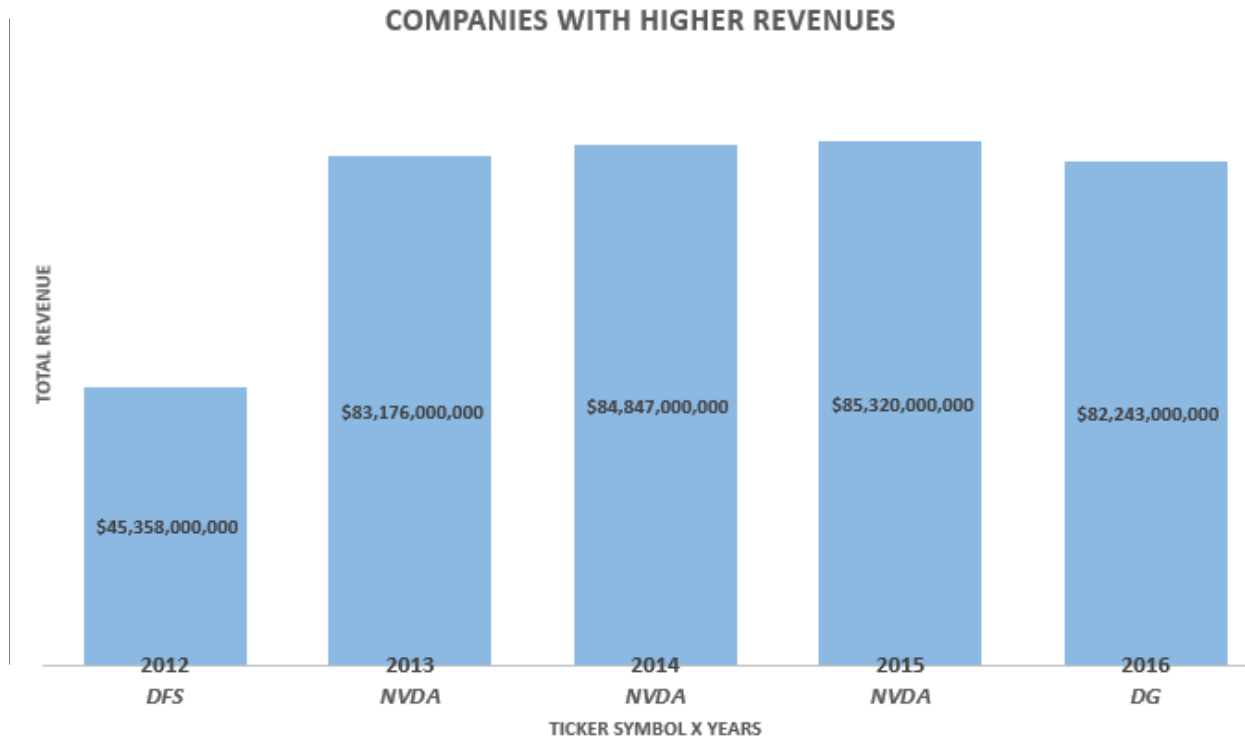


This histogram shows the average revenue for each year.

This histogram has a normal distribution.

We can see that the revenue for all the years analyzed remained practically stable, with the first year analyzed being the year with the lowest revenue. We can also see that the years 2013 to 2015 were practically stable, with little variation during this period. The year of 2016 had the highest revenue average of all the years analyzed. Due to lack of data, we did not include the year 2017 in the analysis.

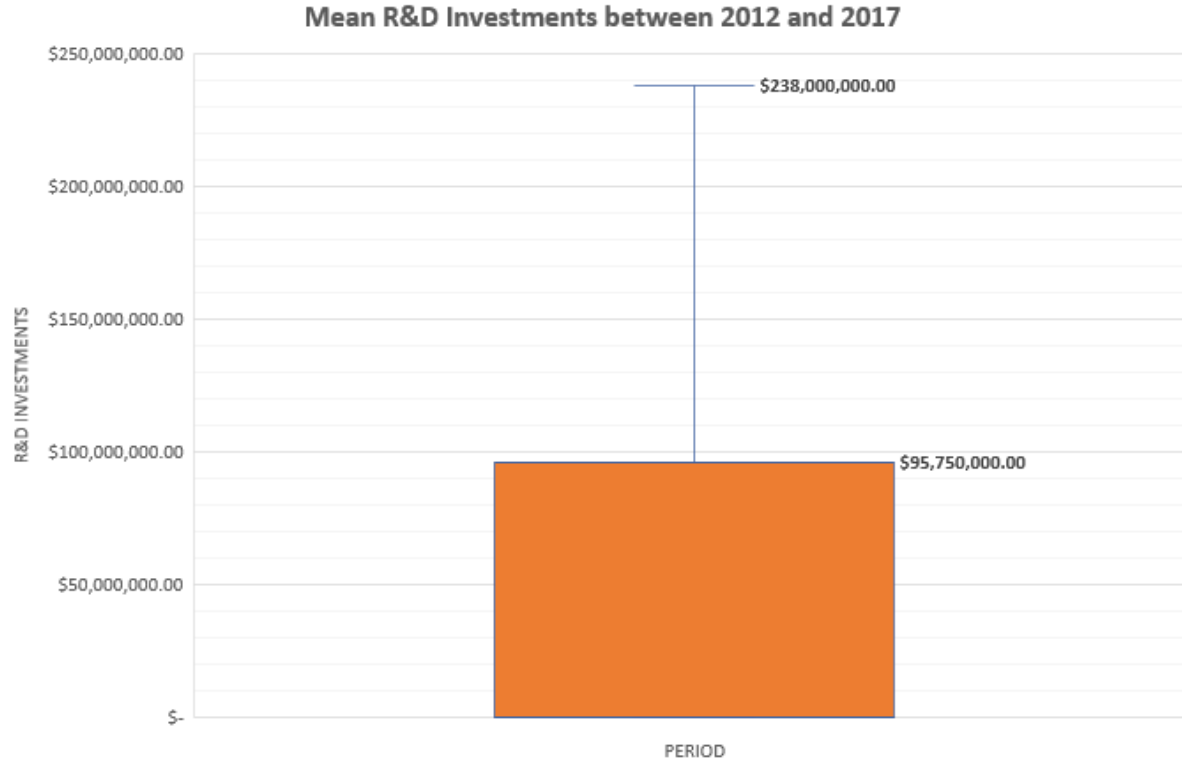
Which are the companies with the highest revenues each year?



This histogram shows the companies that had the highest revenue each year. This histogram has a normal distribution.

We can see that DFS, NVDA and DG were the companies with the highest revenue in the years analyzed. NVDA was kept as the company that had the highest revenue for three years in a row (2013 to 2015) and its revenue was practically stable during that time, showing little variation.

What was the Mean in R&D between 2012 and 2017?

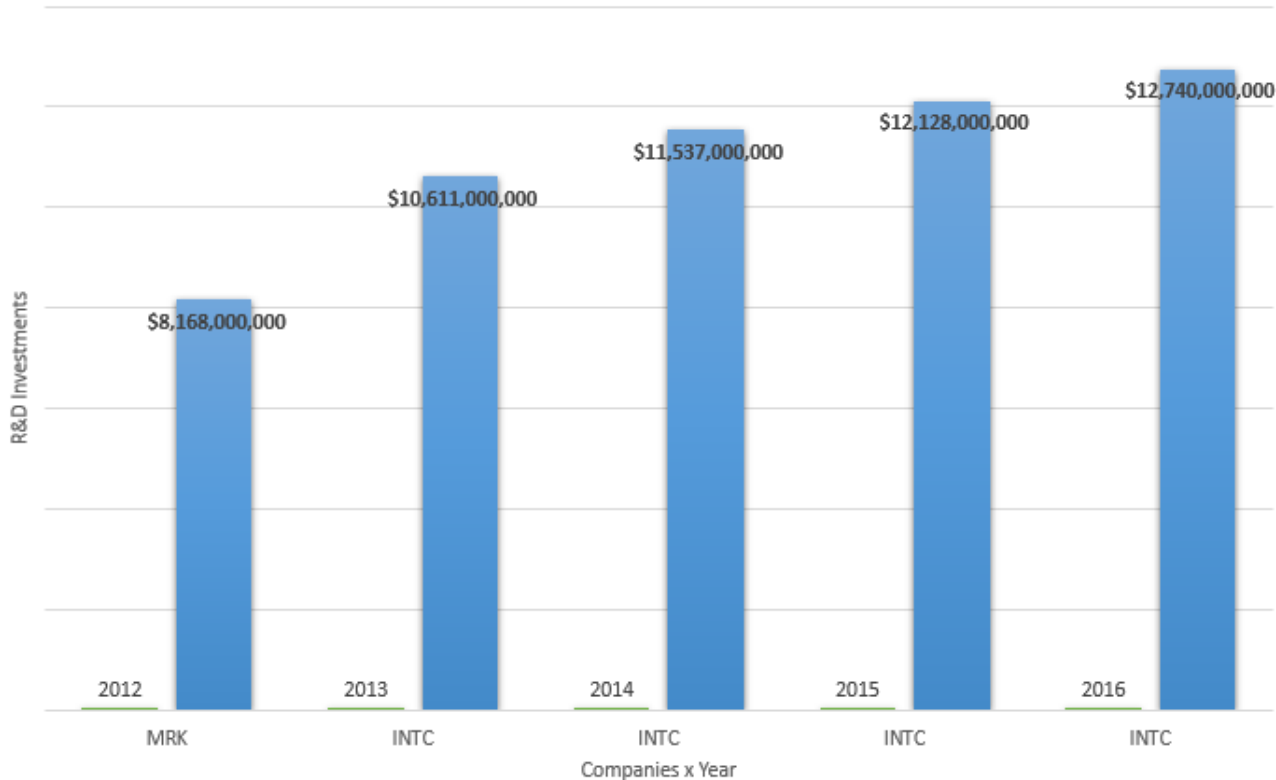


This Box Chart shows the mean investment in R&D between the years 2012 and 2017.

We can see here how was the mean investment made in the R&D sector during the entire period from 2012 to 2017. We can see that 50% of the investment made in R&D was equal to \$ 0, however, 75% of the total investment was \$ 95,750,000 . On average, \$ 238,000.00 was invested in R&D throughout the analyzed period.

Which companies invested the most in R&D each year?

Companies that invested more in R&D

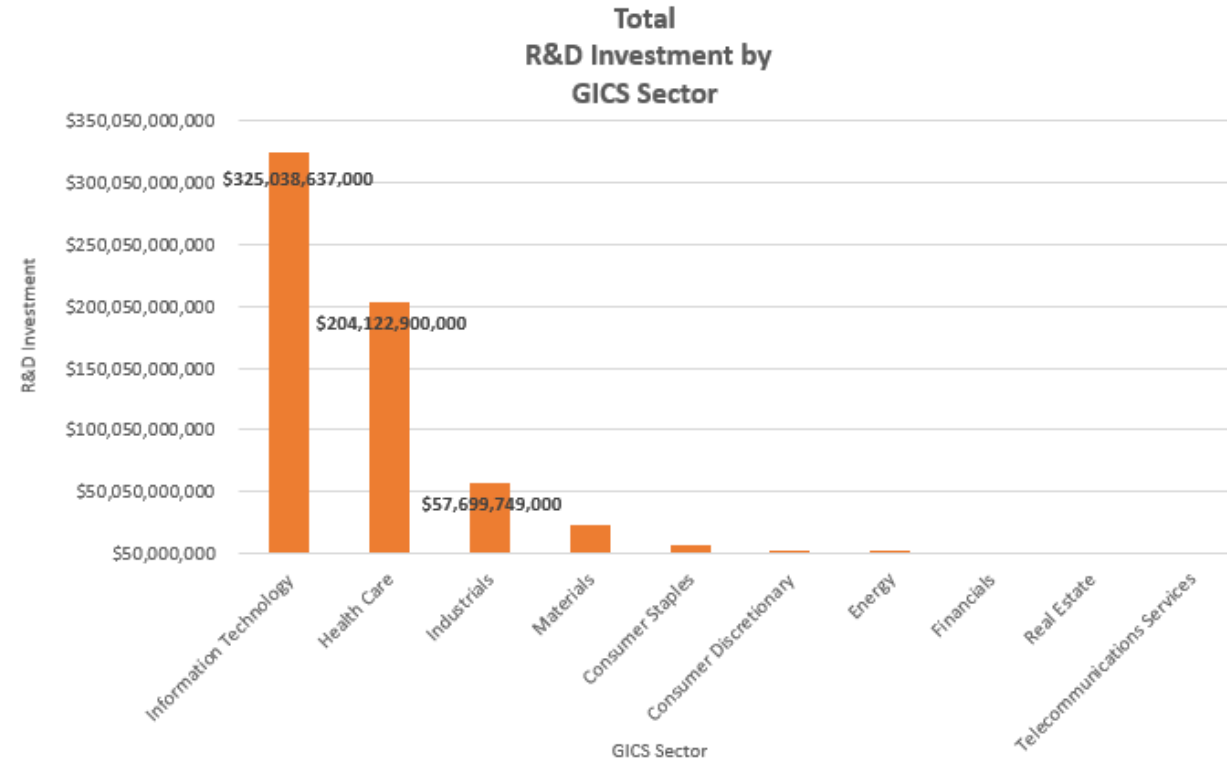


This histogram shows the companies that most invested in R&D during 2012 and 2016.

This histogram has a left-skewed distribution.

This chart shows the companies that most invested in R&D. We can see that INTC was the company that most invested in R&D for 4 years in a row, the average investment made by INTC was \$ 11,754,000,000. The maximum investment made in a single year it was in 2016 worth \$ 12,740,000,000.

How much each GICS Sector invested in R&D ?



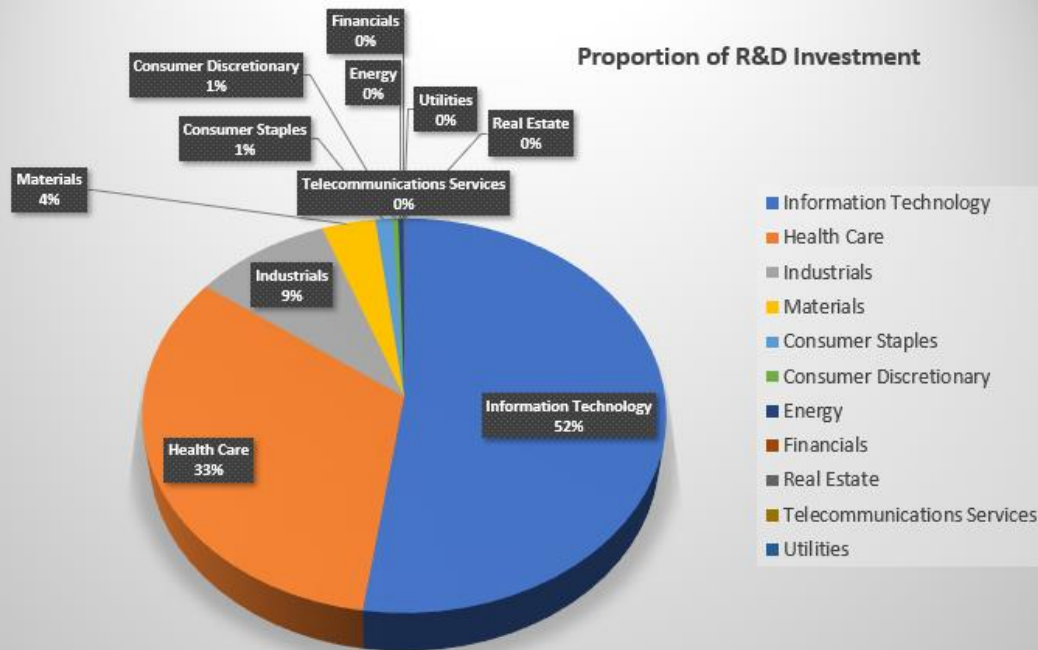
This histogram shows how much each sector invested in R&D during the years 2012 to 2017.

This histogram has a right-skewed distribution.

Here we can see how much each sector invested in R&D during the period from 2012 to 2017. The sector that most invested was Information Technology, with \$ 325.0380637,000 followed by the Health Care sector with a total of \$ 204,122,900. Finally, we see the Industrials sector with a much lower value of \$ 57,699,749,000. We can see that there is a discrepancy in investment in R&D comparing the other sectors, some invest a lot, while others invest practically nothing.

Proportionally, how much each sector invested in R&D?

This pie chart shows proportionally how much each sector has invested in R&D during 2012 and 2016.



Here you can have a different kind of view of the investments that each area makes with the R&D sector. We can see that the information technology sector made the the most majority of R&D investments, accounting for more than 52% of the total, followed by the healthcare sector, with 33%. The Industrials sector was the third sector that most invested in R&D with 9%, followed by the Materials, discretionary and basic consumer sectors with 4% and 1%, respectively. We can see that several are the sectors that had investment proportional to 0%, showing that there is a huge space for the development of R&D in several sectors.

Can we associated R&D investments with a revenue growth?

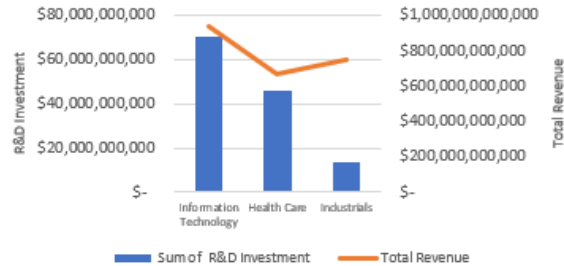
Had the sectors that most invest in R&D a revenue growth?

These histograms show the correlation between investments in R&D and revenue from 2012 to 2016.

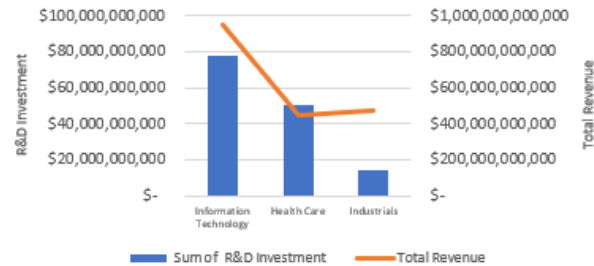
All histograms has a right-skewed distribution.

Can we associate investment in R&D with revenue growth? Analyzing the histogram we can see that YES. If we look at the Information Technology sector, we can see that the more he invested in R&D, the greater his long-term return on revenue was. When analyzing the Wealth Care sector, we have a different perspective, its investments in R&D were practically stable in 2014 and 2015, during this period its revenue was also stable, with little variation, however, in 2016 the sector invested less in R&D and had a reduction in your revenue. We can see that the same movement happen in the industrial sector. We can conclude that the sector that invests more aggressively in R&D has a medium and long term return on its revenue.

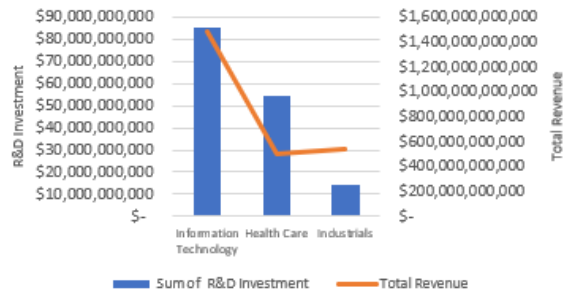
2013



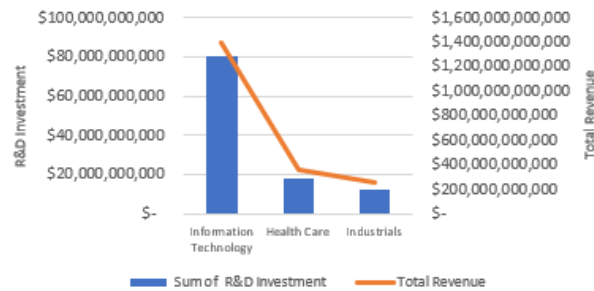
2014



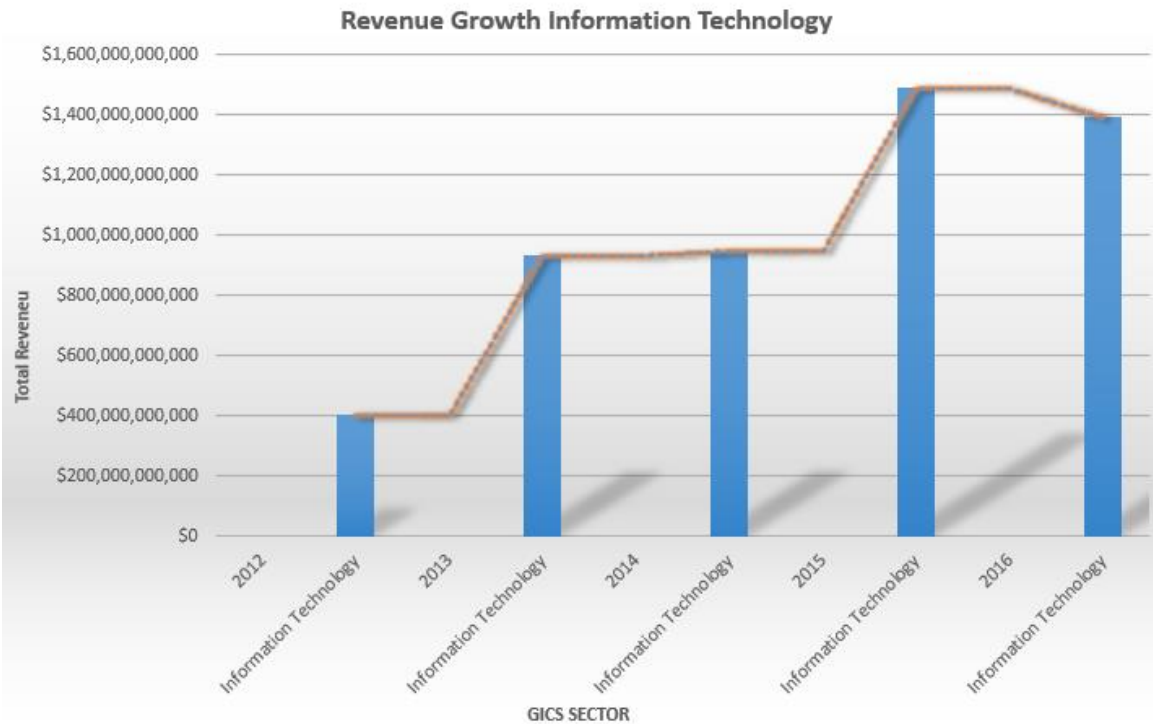
2015



2016



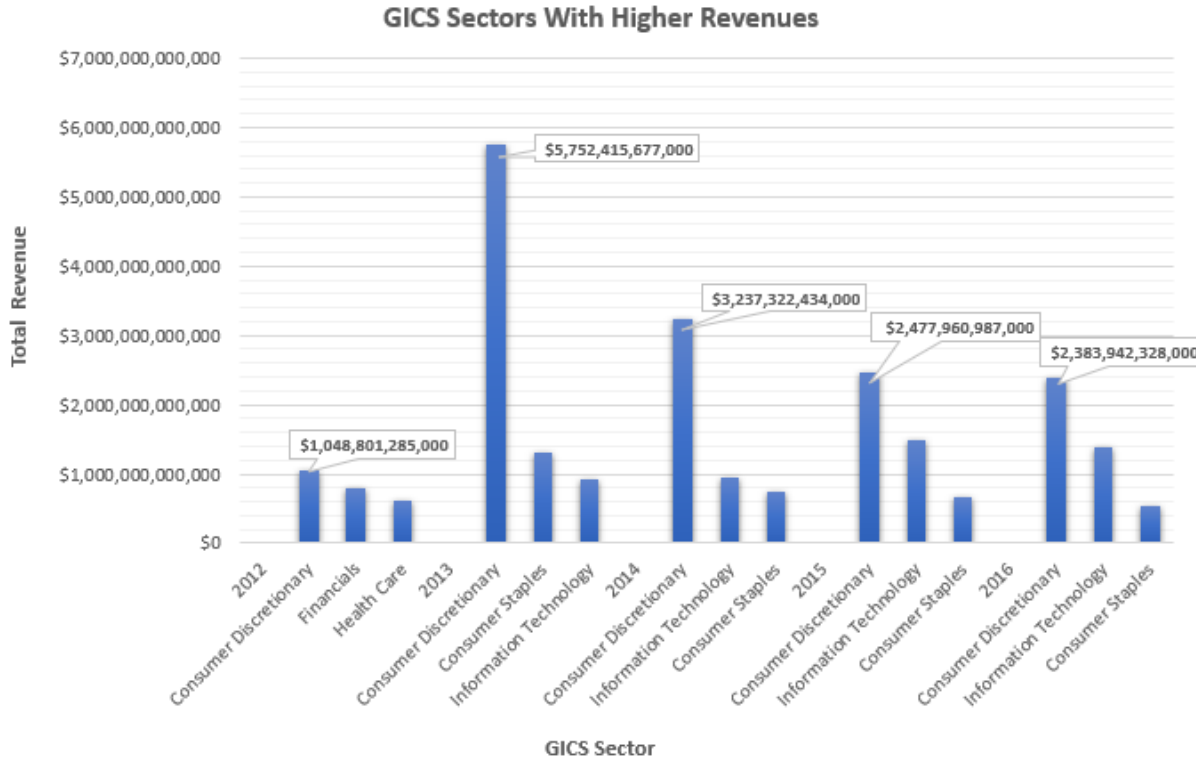
How was the Information Technology sector's growth trajectory?



This histogram shows the growth trajectory of the revenue in Information technology sector. This histogram has a left-skewed distribution.

We can see that since 2013 the Information Technology sector has had a steady growth, with a significant increase in revenue from 2014 to 2015. Analyzing the previous histograms we will also see that 2015 was the year that the sector made a leap in investment in R&D. We can see that the growth of the sector has had few downward variations and that its jump in revenue is linked to its growth in investment in R&D. We can conclude that the investment in R&D compensated for the medium and long term, bringing growth stability to the sector.

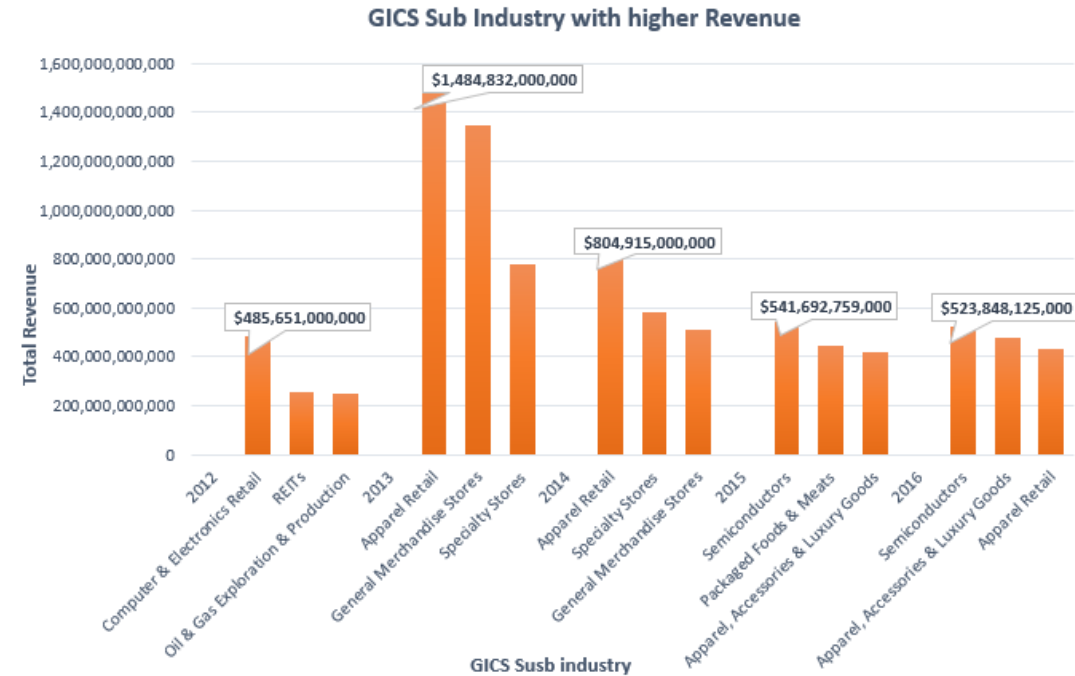
Which GICS sectors had the highest revenues in the periods listed ?



This histogram shows the sectors that had the higher revenue on each year. All histograms has a right-skewed distribution.

Doing an analysis by sectors, we can see that the sector with the highest revenue was the Consumer Discretionary sector, regardless of the year analyzed this sector has always obtained the highest revenue. We can see a significant jump in the sector's revenue in 2013, but we see that since 2014 the sector's revenue has been falling. It is interesting to see that since 2014 the second sector that had the highest revenue was the Information technology sector, the sector that most invested in R&D, as analyzed in the previous chart.

Which GICS Sub Industry had the highest revenues in the periods listed ?

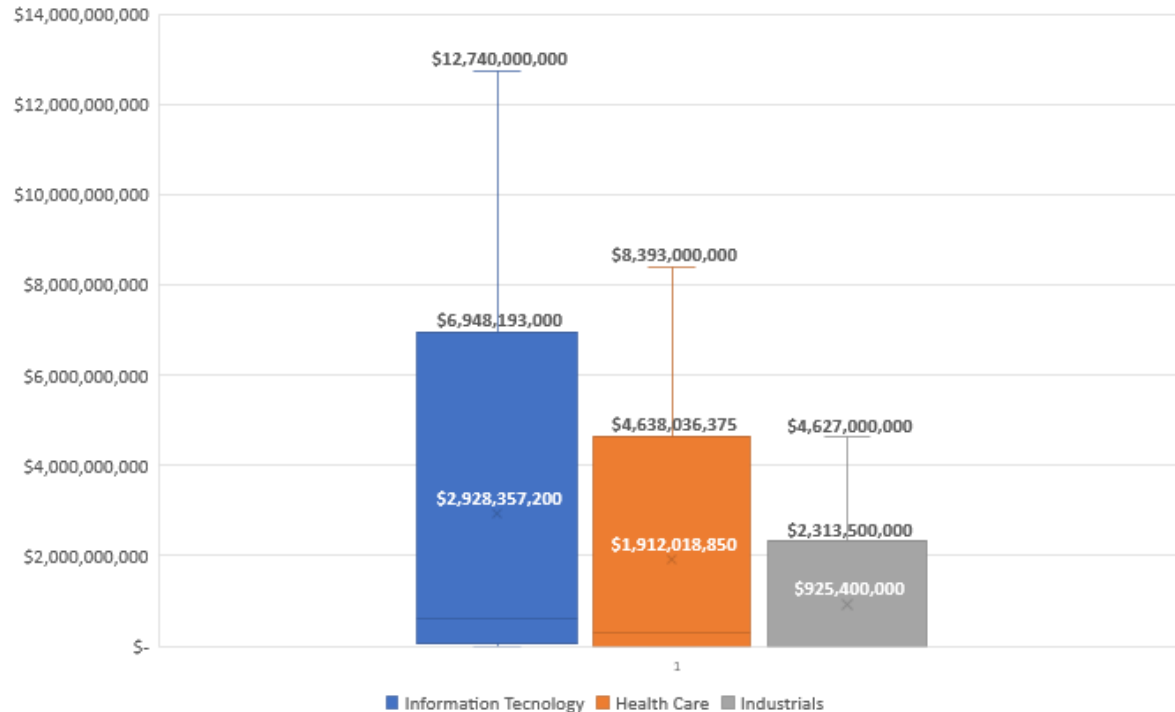


This histogram shows the GICS sub-sectors that has the higher revenues in each year. All histograms has a right-skewed distribution.

With the chart at the side, we can see the GICS sub-sectors that had the higher revenue each year. We can see that in 2013 and 2014 the Apparel Retail sector had the higher revenue, this sub sector is related to the Consumer Discretionary sector which in 2013 and 2014 had its highest revenue (see previous chart). However, it is interesting to see that the GICS sub-sector that had the higher revenue is not always linked to the GICS sector that had the higher revenue. Analyzing the years 2015 and 2016, the Semiconductors GICS sub-sector led as the sub-sector with higher revenue, however, in these years the GICS sector that most invoiced was the Consumer Discretionary and not the Information Technology whose the Semiconductors sub sector belongs.

Whichs there any similarity in R&D investments on the Information Technology, Health Care and Industrials sectors?

Investment in R&D from Information Technology , Health Care and Industrials Sectors



This Box Chart shows the R&D investment standard made by Information technology, Health Care and Industrials sectors during 2012 to 2016.

Comparing the median numbers, we can see that the Information Technology sector has \$ 611,100,000 while Health Care has \$ 284,021,500 whereas the industrial sector has a median of \$ 0. When we look at standard deviation we can see the difference between the investments made in R&D. The standard deviation of the Information Technology sector is \$ 2,613,888,221 while the Health Care sector is \$ 1,880,031,001 and Industrials \$ 664,938,157, this show a big difference between the investments comparing the sectors. The investment variability in IT companies is greater than in Health Care and compared to industrial this variation is even bigger. We can also see that 75% of IT companies invested more than 1.1 billion, while 75% of health care companies invested 8.3 million and Industrials around 4.6 million. This shows the superiority of the investment made in R&D in the IT sector when compared to the Health Care and Industrials sectors.