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EXAMINING THE RELATIONSHIP BETWEEN ENGAGEMENT RATE AND FREQUENCY OF POSTS IN VARIOUS SECTORS AND ITS CLASSIFICATION

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ABSTRACT

Social media has developed into a significant source of knowledge and amusement for people as well as a vital tool for businesses to interact with clients and advertise goods and services. Digital marketing and communication strategy must include social media engagement as well as the frequency of posts. This research study analysis the interaction between both variables, the frequency of postings which is the number of times a company publishes material on its social media accounts and the degree of engagement which is the amount of user interaction with a brand's content on social media platforms, such as likes, comments, and shares. The results of the study support what previous research said about this topic. High engagement levels are linked to increased brand recognition and consumer loyalty and regular and consistent posting may help maintain a strong online presence and boost brand visibility. The research concludes with the contribution that in order to increase engagement levels, it is important to provide compelling content that connects with the target audience and encourages interaction and most important, that the ideal frequency of postings varies among platforms and sectors, encouraging businesses to determine the best posting frequency in order to obtain the highest user engagement levels.

Key words: *social media, engagement, frequency, posts, platforms, industries, digital marketing, interaction, online presence, target audience*

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1. INTRODUCTION. OBJECTIVES AND THEME JUSTIFICATION

The objective of this study is to understand how posting frequency affects user interaction on social media sites. The research investigates the relationship between engagement rate and publishing frequency across various industries. By analyzing data from several sectors, marketers may see trends and patterns in the relationship between posting frequency and engagement rate. They can then use this information to direct their own social media operations. This may help businesses make their content calendars as interactive and effective as possible to reach their target audience.

Data from a number of reports released by the consulting and research company Rival IQ was studied and managed, the factors of interest were gathered over a period of six years. The data will be normalized and standardized in order to conduct the study and to provide meaningful results as well as understanding what patterns effect each sector according to the platform used. We first carried out a correlation analysis of the variables across all industries to spot any differences, and then we looked at each variable separately in turn to see how it evolved. Second, we carefully studied each industry's evolution by taking an unbiased look at it. We were able to draw some insightful findings regarding the interplay of the factors from both experiments and provide some suggestions.

2. THEORETICAL FRAMEWORK

Established companies, entrepreneurs, and marketers understand the pressing need to keep up with this rapid rhythm of updating their business models and remaining current with all the changes occurring in an age where technology rules. (Bashar et al., 2012). The appearance of new information and communication technologies that fully integrate with the internet and social networks has altered market dynamics, threatened the competitive positions of long-standing companies, and increased the power of consumers (Alves et al., 2016). In addition, there has also been a significant impact on how businesses operate, advertise, collaborate, and perform. (Saravanakumar & Suganthalakshimi, 2012).

The environment's quick evolution has had an impact on how businesses promote themselves online. Organizations view themselves as operating in a highly competitive world where the ability to set themselves apart from rivals and be the preferred firm can be a crucial competitive advantage (Bilgin, 2018). Because of this, businesses have invested a tremendous amount of money in trying to understand how customers think and how to use their various communication channels to grab their attention and cement a favorable image in their minds (Bilgin, 2018). Companies have shifted to a new paradigm where technology controls the content, leading to repercussions such as a much larger reach and devoted marketing managers with the ability to influence existing and potential customers (Farook & Abeysekara, 2016).

More particular, the internet's capacity to leverage user voices has resulted in a significant change of power (Farook & Abeysekara, 2016). Today, consumers gain a new role with social media (Nadaraja & Yazdanifard, 2013). Customers have evolved into prosumers, influencing the creation and provision of goods and services in accordance with their preferences (Whiting & Deshpande, 2016). Consumers now have the tools necessary to find, evaluate, choose, and purchase goods and services based on their preferences (Alves et al., 2016). Rather of being only passive participants as they formerly were, they are becoming active creators and influencers (Hutter & Hautz, 2013). Customers have now the ability to respond to the business and share their views of the brand, creating a word-of-mouth effect that has a significant impact on the company's image. In fact, word-of-mouth marketing has a major impact; in the Whiting & Deshpande (2016) survey, over

85% of participants reported having bought a product after reading a favorable internet review whereas Amandeep et al. (2017) claim that 35% of people make purchases as a result of attractive advertisements. This demonstrates that consumers place more faith in recommendations from friends and family than they do in advertisements from businesses.

Companies can no longer control the rules of communication; instead, they must welcome discourse by being pertinent to customers (Farook & Abeysekara, 2016). This cultural shift tries to make businesses more customer-centric by transforming marketing communication into a multi-dimensional, two-way peer-to-peer interaction in which both the brand and the consumer engage (Hutter & Hautz, 2013). In other words, businesses must change their focus from merely attempting to sell to more closely connecting with customers (Farook & Abeysekara, 2016).

As a result, marketing methods have been shifted in terms of strategy and tactics in order to maintain customers' attention and engagement with the business and its products. (Alves et al., 2016). Marketers are forced to approach customers differently, allowing them to express their opinions and showing them care (Bashar et al., 2012) because social media use do influence the purchase decision-making process (Hutter & Hautz, 2013).

2.1 DIGITAL MARKETING

Digital marketing is a collection of online marketing strategies that aims to convert consumers (Selaman, 2021). The two key characteristics of digital marketing that the author defines are personalization, which enables companies to create detailed user profiles and boost conversions over traditional marketing, and massiveness, which denotes a wider reach with a lower budget and the ability to tailor how the message is delivered to specific public groups. Per Kannan & Hongshuang (2017), digital marketing is "an adaptable, technology-enabled process through which organizations engage with consumers and partners to collaboratively develop, convey, deliver, and maintain value for all stakeholders". Kim et al. (2021) describe digital marketing as brand-new approaches of interacting with customers in order to inform, engage, and offer them goods and services.

These experts and a large number of others think that digital marketing will continue to lead the technology revolution as an effective instrument that enables firms to track,

assess, and manage the results of marketing initiatives. In fact, it is nearly difficult to create a marketing plan without taking social networks into account (Bashar et al., 2012). Due to increased social engagement, diffusion, and interaction, more resources—including time and money—are reallocated, and products are revised and improved (Kannan & Hongshuang (2017).

2.2 SOCIAL MEDIA

People by nature are sociable and gather and exchange knowledge that is significant to them. The advent of the internet-connected world has had a significant influence on how we communicate and receive information (Farook & Abeysekara, 2016), therefore social media must provide a similar environment in the online space (Bashar et al., 2012) ensuring the sociability part that people seek for. Due to this, corporate relationships are evolving from transactional to social ones in modern society (Bashar et al., 2012). According to a McKinsey Quarterly report and Whiting & Deshpande (2016), 90% of businesses use social media as their main digital tool to connect with clients, and that number is predicted to rise even more in the coming years. Saravanakumar & Suganthalakshimi (2012), and Pew Research Center found that 73% of internet users in the US use social media on a regular basis.

Social media offers a technology platform for online communication, content creation, and sharing, as well as for marketing research, product development, and advertising. When comparing social media to other digital and conventional platforms, social media has emerged as the most potent and important platform for online branding (Mangala & Neelamalar, 2015). This is why instead of viewing this new marketing strategy as a rival to the ones already in place, we should think of it as an additional integrated marketing channel (Farook & Abeysekara, 2016).

The social media space serves as a major hub for individuals from all over the world who love exchanging interesting content for their personal, professional, commercial, and informational needs (Bilgin, 2018 and Kim et al., 2021). Social media is not only for users, though. Businesses are mostly concerned with engaging with clients and closing deals (Whiting & Deshpande, 2016). Social media has made it possible for businesses to quickly, conveniently, and successfully reach their target consumers (Nadaraja & Yazdanifard, 2013) and build relationships with them (Whiting & Deshpande, 2016).

Social media technologies provide companies the chance to connect with customers and enhance their experiences (Williams & Chinn, 2012). Additionally, organizations implement it to market and promote themselves (Kim et al., 2021), for sales marketing, customer relationship management, and service delivery (Alves et al., 2016).

The ability to connect with communities interested in their goods and services is provided by all social media platforms, which has an impact on marketing and business performance. Therefore, it is essential to fully comprehend the function of social media networks and how they are connected to one another (Nadaraja & Yazdanifard, 2013).

2.2.1 SOCIAL MEDIA MARKETING

Social media marketing (SMM) is the term used to describe marketing conducted through social media (Nadaraja & Yazdanifard, 2013). SMM is a collection of tools for social interaction that aims to turn communication into a dialogue that is interactive (Shawky et al., 2019) and to build a community around it (Culnan & McHugh, 2010). SMM is a strategy used by brands to engage with and pique the attention of current consumers on social media platforms like Instagram, Facebook, and Twitter (Saravanakumar & Suganthalakshimi, 2012).

Extensive study shows that social media marketing is a successful strategy for building strong relationships with customers and has an impact on consumers' intents to like and purchase since it promotes user-to-user sharing of knowledge and experience (Bilgin, 2018). This is why firms must embrace the right innovation at the right time in the appropriate way based on a deliberate choice (Culnan & McHugh, 2010). According to Buzzeto-More (2013), 83% of managers say SMM has now become a strategic requirement for a firm to flourish, and nearly 95% of managers acknowledge adopting SMM in their marketing mix plan.

Customers have even more ability to influence businesses thanks to the direct environment that social media offers in the construction of brand value (Hutter & Hautz, 2013). However, businesses may also affect how consumers interpret, process, and use advertising to lead them to a buying phase of the consumer journey. (Hutter & Hautz, 2013).

Despite the fact that more businesses are using social media marketing, most of them still find it difficult to assess how beneficial it is given how little is known about how these channels are utilized, what they can do, and how customers engage with them (Farook & Abeysekara, 2016).

Brands are beginning to understand that getting merely likes will not be sufficient in the long term. It is not a wise investment if users never interact with the brand's content or come back (Mangala & Neelamalar, 2015). Social media marketing is more than just generating comments or profile clicks, according to the Rival IQ social media benchmark analysis, which was conducted annually over a period of five years from 2017 to 2022, social media marketing involves more than just generating comments or profile clicks. They contend that the goal of social media is to raise audience size while simultaneously raising the percentage of audience members who engage. As a result, businesses have begun evaluating and establishing brand engagement rates depending on the customer's involvement with the page in order to focus more on online consumer engagement in their social networking sites (Mangala & Neelamalar, 2015).

It's critical for businesses to comprehend social media marketing and to use best practices in order to draw in and keep consumers while avoiding competition from rival enterprises (Whiting & Deshpande, 2016). Understanding how technology is facilitating people's social connections through their social networks and how your business may benefit from that understanding are key components of SMM (Bashar et al., 2012). Any data-driven marketer is interested in the performance of the post as well as how it compares to similar ones from rivals. In order to utilize and respond to customer-generated information, Culnan & McHugh (2010) contends that every company must learn how to do so.

When a business is able to provide customers what they want and satisfy their time and information demands, only then will the effectiveness of a social media marketing plan be profitable (Bashar et al., 2012).

Nadaraja & Yazdanifard (2013), clearly differentiates some advantages of social media marketing. The key benefits that social media marketing tactics provide are cost savings since platforms are frequently less expensive than middlemen, for example, and increased reach because they contact clients who may not have been reached otherwise owing to temporal or geographic constraints. Whiting & Deshpande (2016) adds one of the most

advantageous features of SMM as having a better grasp of important client segments. This enables businesses to develop better goods and services that increase sales and profitability by better meeting the needs, driving the motivations, and gratifying the wants of the target market. Based on the Annual Report on the State of Social Media Marketing, 92% of marketers feel that social media marketing has increased exposure for their company, and more than half of those that have concentrated on social media have seen an increase in sales (Mangala & Neelamalar, 2015).

Nadaraja & Yazdanifard (2013) stated that the main disadvantage of social media marketing is the time commitment. According to the authors, businesses who do not use a social media management solution will struggle to compete and eventually risk becoming obsolete. It is unrealistic to invest only a little number of resources in social media and expect to get significant benefits. Additionally, there are some concerns about client privacy and trust as well as potential copyright issues (Nadaraja & Yazdanifard, 2013) that can result in a company losing control over their brand image (Whiting & Deshpande, 2016).

2.2.2 SOCIAL MEDIA PLATFORMS

Social media platforms give businesses new opportunity to enhance internal processes and interact with stakeholders in novel ways becoming highly participative (Culnan & McHugh, 2010). Communities of interest can emerge on social networking sites, which can provide a means of connecting with others (Bashar et al., 2012).

Alves et al. (2016), concurred that the three most popular social networking platforms for companies are Instagram, Facebook, and Twitter. Each of them offers distinctive service features and appeals to various customer types. To begin with, Instagram is distinguished by its photographs and videos. Users are given the option to submit editable material. Most Instagram users are under 30. Secondly, Facebook's distinguishing feature is that it keeps users connected. Users have the ability to exchange messages, upload updates and photographs, and join groups. Facebook also makes it easier for users to remain current on local and global events. Adults are more likely to use Facebook. Finally, tweets, or quick status updates, are the main usage of Twitter. There is a maximum of 140 characters and a maximum of six photos in each post when using the platform (Wadhwa et al., 2017). Twitter users are more likely to be wealthy, educated, and urban residents compared to

users of other social media platforms (Whalda et al. 2017). Alalwan et al. (2017), suggested that although Facebook offers a platform to enhance user experiences, Twitter and Instagram offer a means for real-time updates and interaction. The three sites allow users to geotag content and add hashtags. Additionally, users may choose whether to publish their posts openly or only with followers who have already approved them on Facebook or Instagram.

Several authors agree that interactions on these social media platforms have the most impact on their companies' sales, word-of-mouth, and profitability influencing, in fact, the choice-making process for purchases (Kawasaki & Fitzpatrick (2014) and Gleason (2022). As Hutter & Hautz 2013 reports, the same thing also occurs in reverse. The fan page's irritation has a bad impact on people's overall devotion and engagement (Culnan &McHugh 2010). A "fan page irritation" typically refers to the annoyance or frustration that someone feels when they encounter a page on social media that constantly posts repetitive or irrelevant content (Metricool 2015). This is why the authors, Culnan &McHugh (2010), explain that simply being present on these platforms does not guarantee that customers would be attracted. The value of a particular social media platform is derived from how it performs as a virtual marketplace, not from the platform itself.

2.3 ENGAGEMENT RATE

Many companies struggle with getting customers to notice brand postings and keeping them interested in the content. (Farook & Abeysekara, 2016). User engagement is a key objective of social media activity (Wadhwa et al., 2017), and over the past few years, marketing professionals have focused heavily on digital tools to guarantee engagement with target audiences (Shawky et al., 2019) before, during and after their purchase cycle (Bashar et al., 2012). In fact, according to Whiting & Deshpande (2016), SMM is the only type of marketing that allows a business to have an impact on clients at very specific points during the purchasing process. This is because social media engagement can result from repeated interactions, which is advantageous for both the organization and the audience (Shawyky et al., 2019).

According to Farook and Abeysekara (2016), consumer engagement is made up of the three elements of cognitive, affective, and conative engagement and Yoshida et al. (2014)

promote that social media empower each of these aspects. As per Smith & Gallicano (2015), user engagement is "the evolution from physically engaging with the interface to becoming mentally engrossed in the material it offers and then onto purposefully disseminating the results of this involvement". Shawky et al. (2019) have added to this idea the active customer participation through co-creating value activities and efforts. This concept is also referred to as the motivationally driven behavioral manifestation of customers' brand loyalty that goes beyond real transactions by Van Doorn et al. (2010).

According Farook & Abeysekara (2016), consumer participation rises as social media marketing efficacy soars. Marketers must choose their material carefully because it has a greater chance of influencing consumers. In other words, more effective marketing increases involvement, and this means that content has to be chosen carefully because of the great potential it has to affect customers. Customers will not use social media unless they can access material that is pertinent to them directly, enjoy it, and experience a sense of presence, connection, and support from their social network.

Interactivity on social media is crucial for a business looking to engage its audience (Smith & Gallicano, 2015). In fact, engagement has been regarded as the initiator of the development of deep connections with brands (Filo et al., 2015). Without the participation and involvement of the customer, the interaction necessary for establishing engagement would not occur (Farook & Abeysekara, 2016). A consumer may not always get connected with the brand through sheer engagement, though (Smith & Gallicano, 2015). Brands must put their attention into creating and maintaining relationships with customers and other stakeholders through communication and interaction (Ravald, A., & Grönroos, C., 1996). This recognizes the important strategic and practical role that social media platforms play in cultivating relationships with clients (Filo et al., 2015). Publishing material online encourages interaction and the way the public looks for, comments on, and shares it, creating a feeling of community (Smith & Gallicano, 2015), and how people interact with social media posts by like, favoriting, retweeting influences the engagement. (Rival IQ 2017). The interaction that is needed for achieving engagement would not take place without the existence of client participation and involvement (Farook & Abeysekara, 2016). This recognizes the important strategic and practical role that social media platforms play in cultivating relationships with clients (Filo et al., 2015).

Social media platforms provide companies the ability to put the necessary resources in place to develop the customer relationships they seek. The findings of Farook & Abeysekara (2016), demonstrate that variables like trust, privacy, and security have a big influence on consumer engagement.

3. METHODOLOGICAL FRAMEWORK

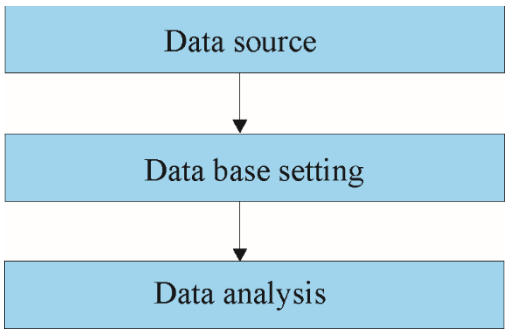
As can be seen, several authors concur that social media should be used efficiently in marketing campaigns. This guarantees the profitability and competitiveness of any firm, regardless of industry, as well as a high rate of post interaction among followers (Amandeep, et al., 2017).

Many businesses are now trying to effectively adopt social media and get the data required to ensure that their next marketing campaigns target the right audience, generate a greater volume of sales and revenue for the business (Whiting, 2016). However, this means that the user must be actively involved in the company and a large number of its activities (Eagleman, 2013).

Customers are being bombarded with thousands of marketing messages, around 6,000 each day is the estimation of Meiners (2010). User exhaustion brought on by the gradual and increasing oversaturation of social media platforms with business messages has significantly reduced engagement and resulted in less-than-ideal returns on social media initiatives (Tafesse & Wood, 2021) The problem of the lack of engagement makes it necessary to investigate the subject in order to find the optimum point between the amount of number of posts and engagement. Because of this, the main goal of this study is to examine the correlation between the level of engagement each industry generates on social media and the post per day.

Three different stages make up the process used to analyze and examine the Rival IQ observations. First, a procedure for gathering the data. Then it is cleaned and standardized, outliers are found, potential patterns and behaviors are studied, and ultimately, the dataset is created. As a schematic way to give the reader a head start, the overview graph below includes the procedures that were conducted (*Graph 1*).

Graph 1. Procedures of the methodology.



Source: Own Elaboration

3.1 DATA SOURCE

In order to carry out this study, we will work with Rival IQ's annual Social Media Industry Benchmark Report, from which we will extract the sector-specific data. We will conduct an exhaustive analysis and draw subsequent, intriguing conclusions.

The Rival IQ report features a total of 150 domestic and foreign businesses from each industry that had active accounts on the three most popular social media sites (Facebook, Twitter, and Instagram), with between 25,000 and 1,000,000 Facebook fans and more than 5,000 followers on the two others.

The Rival IQ research includes the most relevant social media platform indicators from 2017 to 2022 for the 14 most prominent sectors (Rival IQ 2017, Rival IQ 2018, Rival IQ 2019, Rival IQ 2020, Rival IQ 2021, Rival IQ 2022). It is critical to keep in mind that there were initially only 6 industries included in the research, with the remaining 8 coming into being throughout the course of the following years. It is also crucial to emphasize that not all businesses within a sector need to behave uniformly in real life. In this study, even so, we have treated all businesses equally because there is not enough data to distinguish between the firms that form a sector. Now we will briefly describe each of the industries included in the research.

In 2017 the study included the following industries:

- Fashion: The business of creating clothes might be used to define the fashion industry in its most basic form. This covers high fashion, designer apparel, designer clothing at reasonable prices, regular clothing, and cheap clothing (Bashar et al., 2012).

- Food & Beverages: The production and distribution of edible commodities are two divisions of the food and beverage sector, which mostly stems from agriculture (GLOBAL EDGE).
- Health & Beauty: Everything connected to hair care, skin care, cosmetics, perfumery, deodorants, oral hygiene, packaging, and more is included in this business.
- Higher Education: After completing secondary education, it is an optional last phase of formal learning where universities and colleges are all included (Filo et al., 2015).
- Media: Refers to the content industry that creates many sorts of material, distributes it across various channels, and uses a variety of formats. Publication, magazines, newspapers, comic books, social media, cinema, TV, music and streaming platforms are all included (Nadaraja & Yazdanifard, 2013).
- Non-Profits: The non-profit sector is made up of organizations that specialize in a wide range of fields, including technology, education, health, the arts, and many more. Charities, public schools, volunteer work, social services, and labor unions are the key examples given here (Rival IQ).

Four more industries were added in 2018:

- Home Decor: This business produces furniture and textiles for the house, including as bed linen, curtains, bathroom and kitchen towels, floor covering, and upholstery, which are regarded as essentials for human survival. This business has been impacted by globalization and urbanization and is driven by the need for stability, adornment, and self-expression (Rival IQ).
- Hotels & Resorts: The hospitality sector covers the following primary sectors: lodging, travel and tourism, entertainment (casinos, cruises, and gaming), and timeshare (Rival IQ).
- Influencers: Influencers are well-known social media users who have built up a sizable fan base by developing an interesting and authentic online presence. By establishing a plausible connection between their online persona and the commercial business they are promoting, influencers build credibility and earn money from their efforts (Tafesse & Wood, 2021).

- Sports Teams: Organizations involved in the ownership and management of sport teams as well as stadiums and indoor arenas for individual and team sports including football, baseball, and basketball (Filo et al., 2015)

Two more industries were added in 2019:

- Retail: Small companies and chain stores that offer goods to specific customers directly. This comprises, among other things, department shops and specialty enterprises (Rival IQ)
- Alcohol: Manufacturers of alcoholic drinks, such as wholesale distributors, significant retailers, and importers who deal entirely in alcoholic beverages or whose primary source of revenue is this business (Rival IQ)

Two more industries were added in 2020:

- Tech & Software: This industry comprises shares of companies that conduct research, create, or market technologically based products and services. It encompasses system services, open sources, programming services, and software as a service (Rival IQ)
- Financial Services: Various organizations that make it easier for savers and spenders to move money. Banks and insurance businesses are a couple such examples (Rival IQ).

Now that we have briefly explained those industries that are part of the analysis and in which year, they were added to the Rival IQ reports, a summary table with this information is presented (*Table 1*).

Table 1. Summary of the industries of Rival IQ.

YEAR	INDUSTRY
2017	Fashion Food & Beverages Health & Beauty Higher Education Media Non-Profits
2018	Home Decoration Hotels & Resorts Influencers Sports Teams
2019	Retail Alcohol
2020	Tech & Software Financial Services

Source: Own Elaboration

Now, we will explain the main variables of the study. Customer engagement rate per post is the first key indicator, which Rival IQ defines as "measurable engagement on organic and promoted social media postings, including likes, comments, favorites, retweets, shares, and reactions." All of these interactions are divided by the total number of follower accounts to get the engagement rate reported in the statistics. The second variable is the total number of daily posts that have been made in each industry. These two indicators enable marketers to gauge their performance in comparison to that of their rivals (Rival IQ).

3.2 DATA BASE SETTING

In order to be able to work with the information, it was crucial to create a database that had all the content in an Excel-compatible format. However, as this is a written report, all data is presented as graphs with the numerical values shown on the individual images. This made working with the date more complicated. This process was time-consuming because it basically included manually copying all of the numerical data from the report's graphics into a spreadsheet while making sure that the measurement units for the six years of the study were the same. In fact, starting with the report from 2021, the post per day variable is shown as post per week, which means that in order to continue working in the daily units, the data from the reports from 2021 and 2022 for the post per week variable

had to be divided by 7 in order to maintain the daily units. It is divided into 7 days since the entire week, not just the workable days, is considered to be a full week's duration (Rival IQ). The accuracy of the numbers was confirmed by discussing with the teacher in charge of the work about them.

The final dataset consists of a total of 2.849 observations that were collected on an Excel sheet with 77 columns and 37 rows. The data from the 14 industries previously described are included in this dataset, covering the time span from 2017 to 2022 for the three most significant social media platforms: Instagram, Twitter, and Facebook.

The following variables are included in the dataset:

- Industry
- Year
- Engagement rate
- Posts per day
- Percentage of users adding hashtag in a post
- Engagement including video
- Engagement including photos
- Engagement including link
- Engagement including status
- Engagement including IGTV
- Engagement including carousel
- Number of posts per day including video
- Number of posts per day including photo
- Number of posts per day including link
- Number of posts per day including status
- Number of posts per day including IGTV
- Number of posts per day including carousel.

We will only consider the variables that help us to explain the relationship between engagement rate and frequency of posts. The variables that we will use are industry, year, engagement rate, and post per day. This can be seen in the table 2.

Table 2. Sample of the generated dataset.

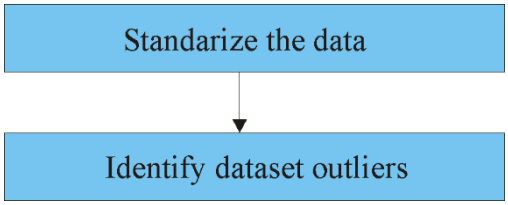
YEAR	INDUSTRIES	INSTAGRAM ENGAGEMENT	INSTAGRAM POSTS PER DAY
2017	Fashion	1,36%	1
2017	Food & Beverage	1,67%	0,6
2017	Health & Beauty	1,14%	1,1
2017	Higher Education	3,55%	0,6
2017	Media	1,25%	0,8
2017	Non Profits	2,29%	0,4

Source: Own Elaboration

3.3 DATA ANALYSES

Now that we have a clearer and more detailed understanding of the contents of our dataset, we will proceed to explain the entire data processing methodology (*Graph 2*). This phase was completed using the tools Excel and R Studio, whose results complement each other and add new insights. Data analysis will involve standardizing the data and identifying outliers.

Graph 2. Steps of data analysis.



Source: Own Elaboration

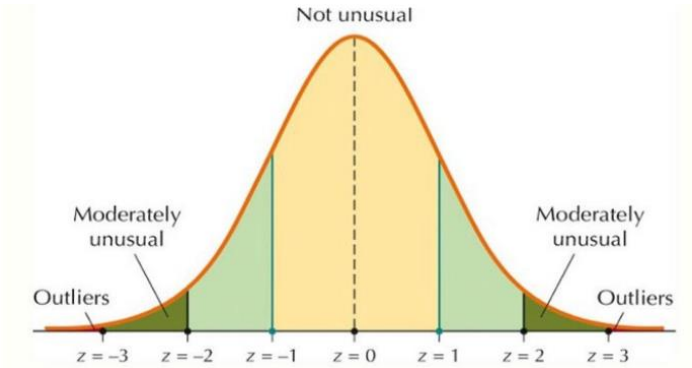
First and foremost, it is essential to standardize the data that will be used in the project. This enables the data to be adjusted and tailored such that they continue to follow a normal distribution (mean 0 and standard deviation 1). To do this, we apply the Z-score standardization that subtracts the value of each observation to the mean of all the data and then divides the result by the standard deviation from the whole data. The R Studio code that was used to standardize the data is as follows:

```
datos1$`INSTAGRAM ENGAGEMENT` <- (datos$`INSTAGRAM ENGAGEMENT` - mean(datos$`INSTAGRAM ENGAGEMENT`))/sd(datos$`INSTAGRAM ENGAGEMENT`)
```

Once the data had already been standardized and was therefore on the same scale, we downloaded a copy of that new dataset in Excel format to see how this change had indeed been affected in a more visual way and to work with this version with the Excel tool.

The next step was to identify this new dataset's outliers and, as a result, eliminate them. Numerous techniques exist to carry out this process, but we will focus on the Z-score method to be consistent with the standardization of the data. Therefore, any observation with values between -1 and 1 will be regarded as not exceptional, and those with values between -1 and -2 or 1 and 2 will also be considered as not unusual even though their deviation is greater. Those observations between -2 and 2 are treated as moderately odd while all observations beyond the 3 and -3 are classified as outliers. This implies that occasionally, if the analyst decides and provides a convincing justification, observations that are above -2 and 2 may be treated as outliers. A graph is shown below to demonstrate this classification in a clearer, more visual manner (*Graph 3*).

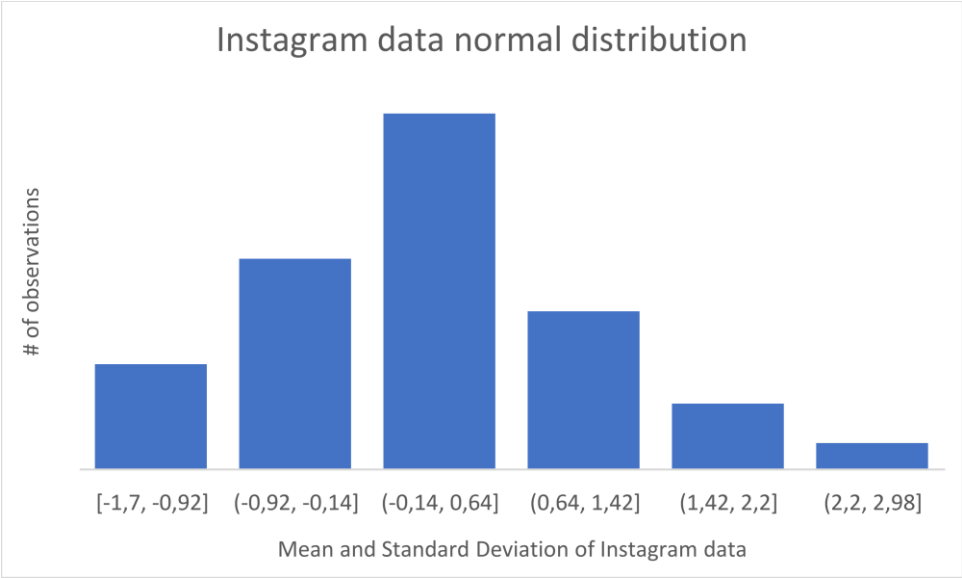
Graph 3. Z-score method.



Source: www.analyticsvidhya.com

It is critical to remember that while this method is quite effective in finding and eliminating outliers, it should not be used with any type of data. Only works properly when data follow a completely normal distribution or one that is very close to it. It is clear from using our database that our findings do, in fact, follow a distribution that resembles more or less a normal distribution. The graph 4 below illustrates this.

Graph 4. Instagram data following a normal distribution.



Source: Own Elaboration

Applying the corresponding R Studio code leads to the outliers, observations whose values are above -3 and 3. As an example, we include the code for calculating outliers for the Instagram Engagement variable and its corresponding outcome.

outliers1 <- datos1$`INSTAGRAM ENGAGEMENT`[which(datos1$`INSTAGRAM ENGAGEMENT` >3 | datos1$`INSTAGRAM ENGAGEMENT` < -3)]

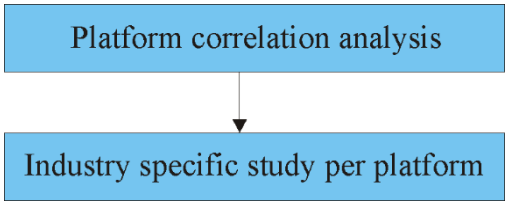
```
> outliers1
[1] 3.07332
```

According to this criterion, there are only 5 observations in the whole dataset that are regarded as outliers (below -3 or 3). These are: Higher Education Instagram Engagement in 2019, Sports Teams Instagram Post per Day in 2022, Higher Education Facebook Engagement in 2017, Media Facebook Post per Day in 2022 and Non-Profits Facebook Post per Day in 2018. To make data processing easier, it is crucial to remember that values above the -2 and the 2 can also frequently be regarded as outliers. Therefore, the number of observations considered as outliers will increase.

4. RESULTS OF THE ANALYSES

In this section, two different analyses were conducted (*Graph 5*). In the first, each of the three social media platforms - Instagram, Facebook, and Twitter - will be examined separately, assessing the industry's engagement rate over a 6-year period, the frequency of posting and the correlation between both variables. In the second analysis, a sector-specific study has been carried out to categorize each industry according to its behavior pattern and the R^2 value obtained. This second analysis allows the observation of the relationship between the two variables. Whether it is positive, negative, or neutral. Last but not least, each industry will also have its own unique trend line, r^2 value, and equation that maximizes that R^2 value included.

Graph 5. Analyses of the results.



Source: Own Elaboration

Before diving into this analysis explanation section, we shall carefully explore the concept of correlation and its potential results. The strength of the linear link between two variables is assessed using their correlation. A positive correlation means that the variables have similar behaviors and that both variables grow (or decrease) in the same direction. When the value is negative, there is an inverse relationship, which means that if one variable rises, the other must fall. Last but not least, a value of zero denotes that there is no correlation between the two variables. This coefficient has a potential range of values from -1 to 1. Any coefficient number that is farther from zero and closer to -1 or 1 indicates a greater link between the two variables. Some industries in this examination show a positive association, but others show a negative relationship.

In the following we define the term R^2. The goodness of fit of a model is measured by the r^2, also called the coefficient of determination (Investopedia). R^2measures how well the model fits the data. A high R^2 value means that the fitted model explains a significant part of the variation in the response variable. A high R^2. is often considered ideal because

it shows that the model can correctly anticipate the values of the response variable. On the other hand, a low R^2. shows that the fitted model does not adequately predict the values of the response variable because it does not adequately describe the variance of the response variable (Minitab, 2018). The R^2 does not intrinsically mean that the model is the best at explaining the connection between the variables, it is only a measure of how well the model fits the data (Investopedia). This is an essential point to remember. A model with a high R^2 for example, could be over-fitting the data and be less generalizable to new data (Minitab, 2018). To provide the best model to describe the connection between variables, it is crucial to assess not only the R^2, but also other metrics of model quality (FactorPad).

In conclusion, even though correlation and R^2 are connected, their measurements are marginally distinct. While R^2 gauges how much of the variance in the answer variable is described by the regression model, correlation gauges the strength of the linear connection between two variables.

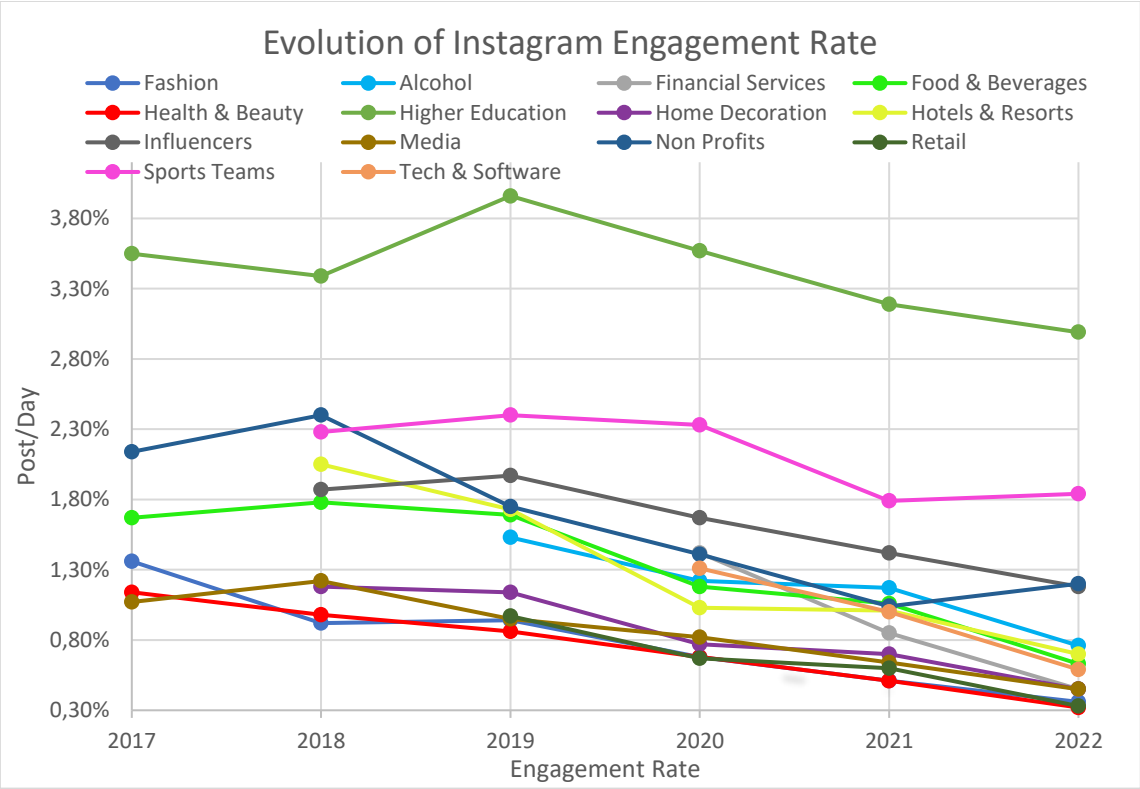
4.1 PLATFORM CORRELATION ANALYSIS

4.1.1 INSTAGRAM PLATFORM

Before examining the relationship between the engagement rate and the daily post volume produced by the Instagram platform, it is crucial to look at how each of these metrics has changed over time in order to see if a pattern exists and be capable of understanding each industry better. With the use of Excel's graphic tools, this section of the study was completed. Here, we will use the original data and keep all the observations.

First, we will display the evolution of the engagement rate (*Graph 6*).

Graph 6. Evolution of Instagram Engagement Rate.

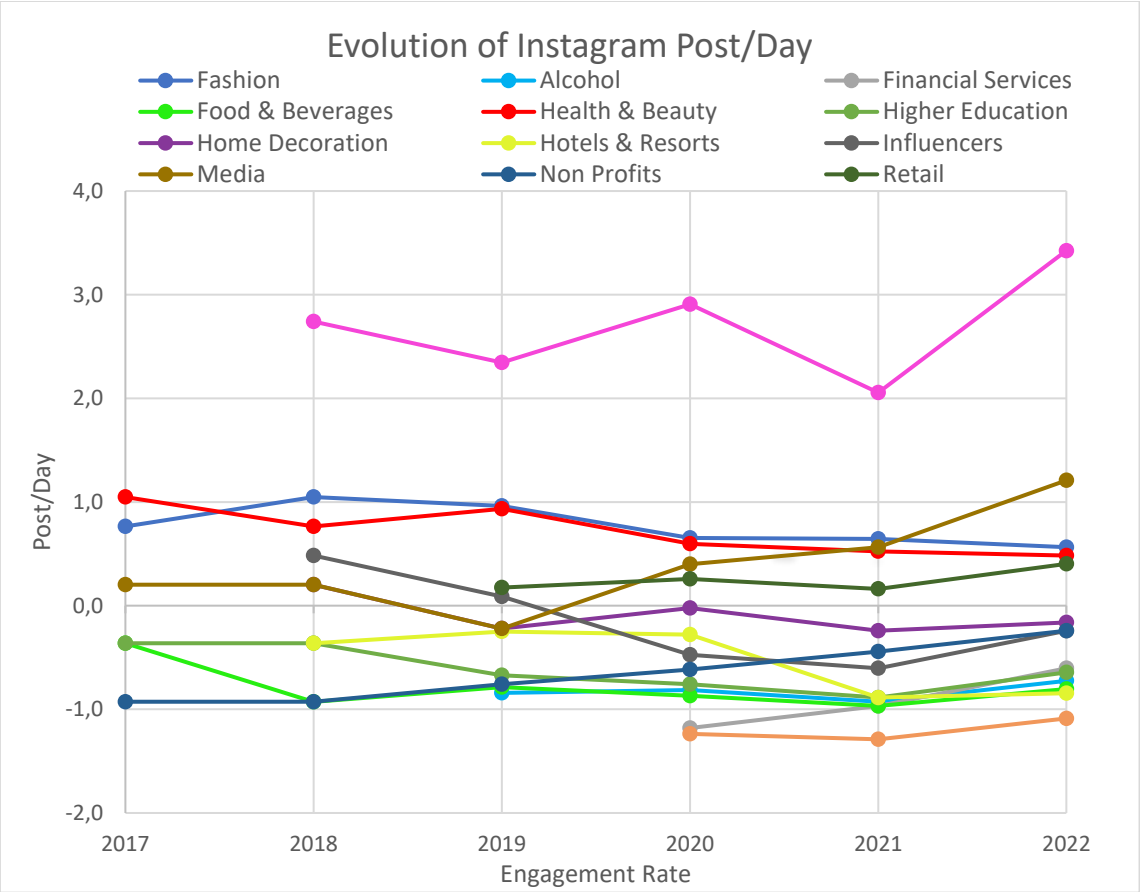


Source: Own Elaboration

From this graph, it is possible to see that the trend is negative, meaning that in 2017 these industries' levels of participation were higher than they were in 2022. This is observed both globally and specifically for each industry. In this figure, it is also clear that the Higher Education sector is far outperforming the rest of the industries in terms of the level of involvement it has generated. Therefore, it might be classified as an outlier in its whole to make it easier to analyze the other industries.

In the second place, we looked at the development of Instagram's post frequency in graph 7.

Graph 7. Evolution of Instagram Post/Day.

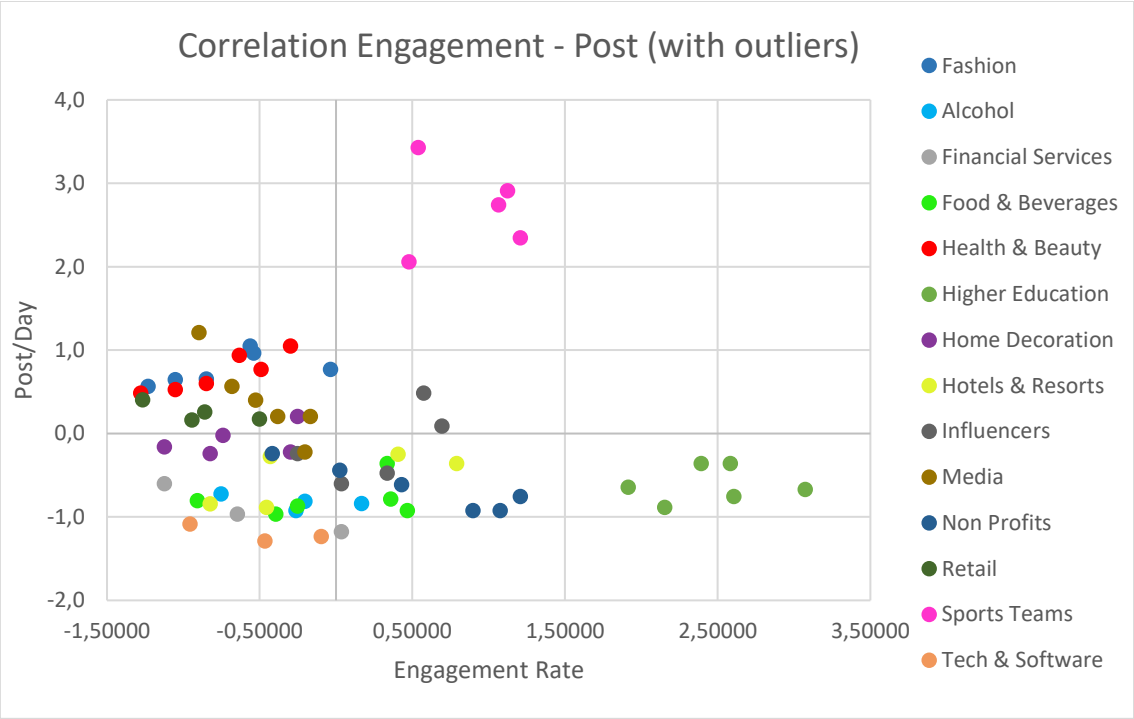


Source: Own Elaboration

In this case, the overall values have been quite consistent over the years, making it more difficult to lump all industries under one general trend.

Now we can go on to studying how these two variables relate to one another in graph 8.

Graph 8. Correlation Engagement-Post (with outliers).



Source: Own Elaboration

This graph makes it clear that Higher Education and Sports Teams exhibit behavior that is very different from that of other industries. The first one is considered an outlier in terms of posting frequency and the second one in terms of engagement rate. Additionally, the remaining industries convert into comparable value ranges. Therefore, it would be interesting to make a small distinction between these other industries in order to classify them according to how they publish and how this affects their level of interaction. This would enable businesses to assess which category they fall under and take the necessary steps to use social media to achieve their goals.

We went back to standardizing the original data without these two industries that were considered as outliers to better classify the industries that are not thought of as outliers (*Table 3*).

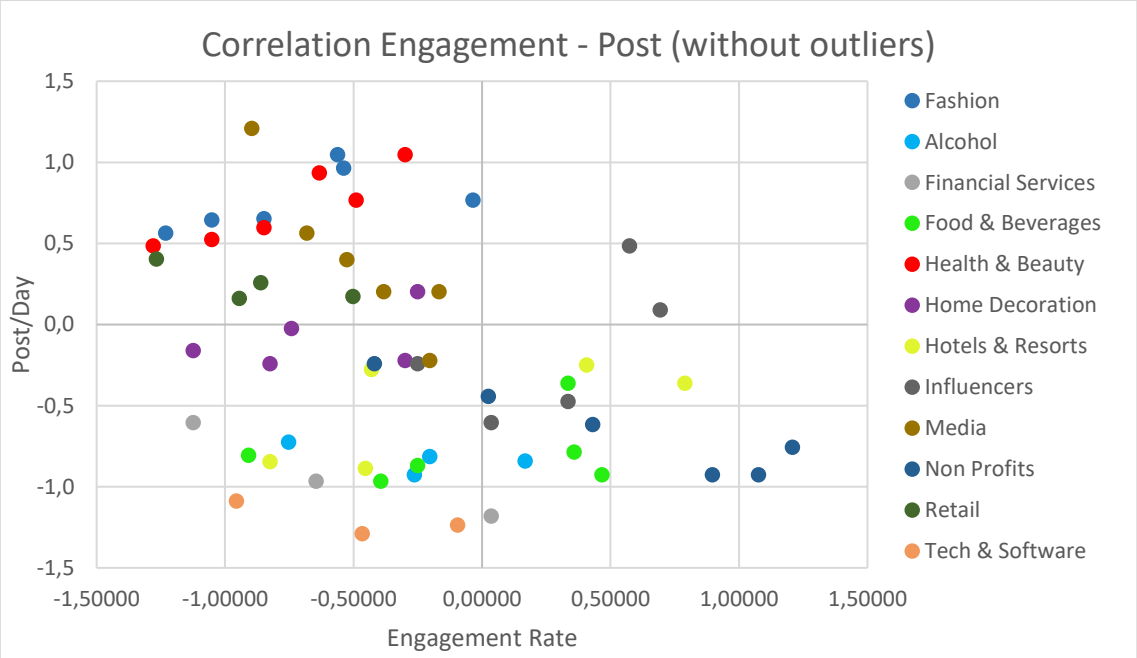
Table 3. Standardized data set in Excel-1.

YEAR	INDUSTRIES	Inst. Stand. Engagement Rate	Inst. Stand. Frequency
2017	Fashion	0,47446	1,4
2017	Food & Beverage	1,08343	-0,3
2017	Health & Beauty	0,04229	1,8
2017	Media	0,25837	0,5
2017	Non Profits	2,30137	-1,1

Source: Own Elaboration

Now that the data are standardized and free of outliers, we can repeat the correlation graph to determine how the data are distributed and whether any patterns emerge. This can be seen in graph 9.

Graph 9. Correlation Engagement-Post (without outliers).



Source: Own Elaboration

The remaining industries in this graph may be seen more clearly, which makes it easier to classify them into three distinct groups. All industries with Post/Day above the mean, that is, with y-axis more than 0, and those with a below-media level of engagement, that is, with x-axis less than 0, would be included in the first group. The industries that consequently are included in this group are Health & Beauty, Fashion, Media, and Retail.

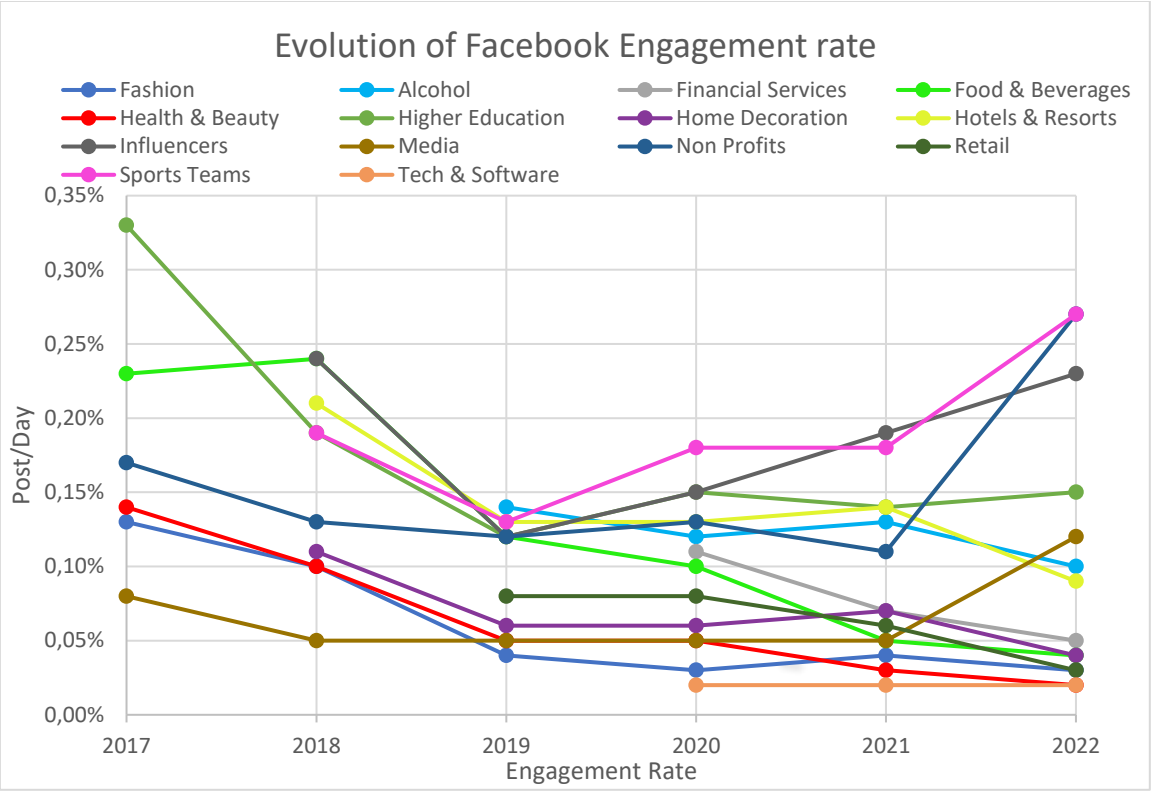
However, this last industry mentioned, Home Decoration, it is positioned to the x-axis, so it is more difficult to associate it to a specific group. Likewise, the second group was comprised of those industries that posted less frequently and whose levels of involvement varied between values close to the average while showing a more negative behavior. This includes the following industries: Tech & Software and Financial Services. Finally, the third group included those industries that posted less frequently and whose levels of involvement varied between values close to the average while showing a more positive behavior. This is the main difference with those associated with group two. This includes the following industries: Alcohol, Hotels & Resorts, Food & Beverages, and Non-Profits.

With regard to the Influencers business, it can be challenging to predict how it will act within the aforementioned categories. Given that it exists across all sectors and that the audience it reaches greatly relies on the type of influencer and the good or service being promoted, it exhibits much more erratic behavior. Because of this, classifying this business is more difficult.

4.1.2 FACEBOOK PLATFORM

The second social media network we will discuss is Facebook. We will follow the same procedures and methods that we did while analyzing the Instagram platform. As a result, we will show the evolution of the engagement rate without eliminating outliers. This can be seen in graph 10.

Graph 10. Evolution of Facebook Engagement Rate.

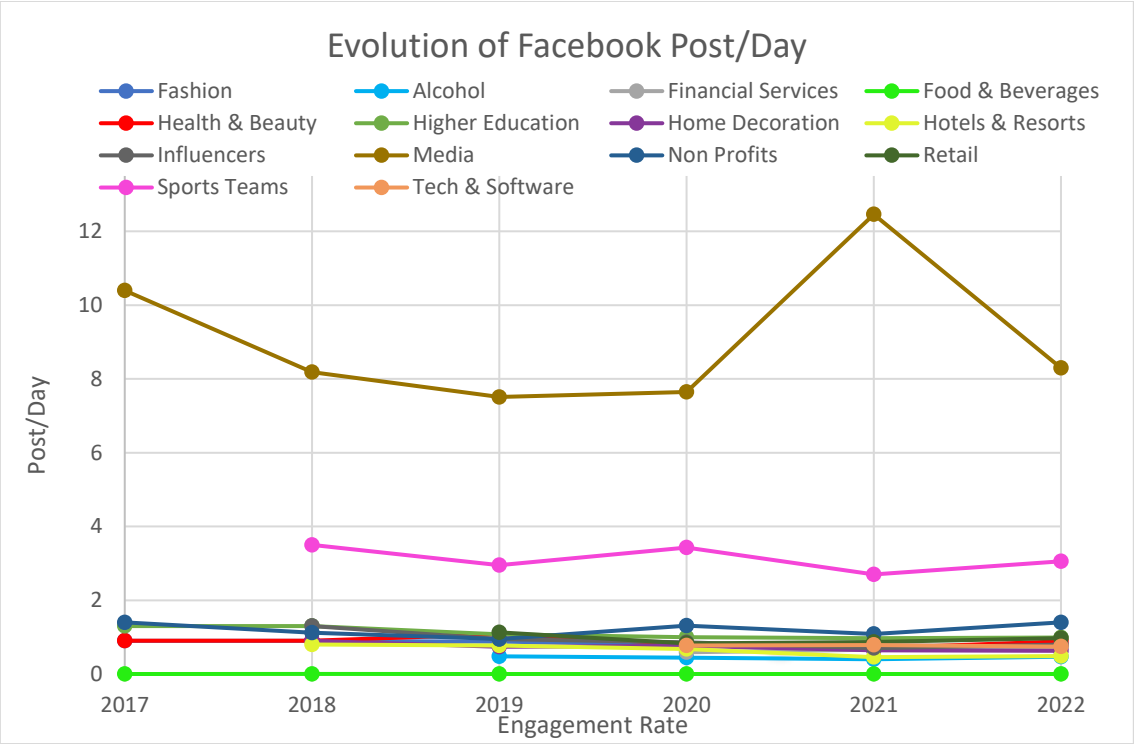


Source: Own Elaboration

In this case, we see a different pattern of activity. This graph demonstrates how several industries also exhibit a downward tendency over time. We see a severe decline in participation in 2019 but then see significant growth in the years that follow. This is plainly discernible, for instance, in the Influencers and Sports Teams industries. We were unable to classify a whole industry as an outlier in this characteristic in contrast to what happens on Instagram.

In the second place, we studied Facebook's post frequency development. This can be seen in graph 11.

Graph 11. Evolution of Facebook Post/Day.

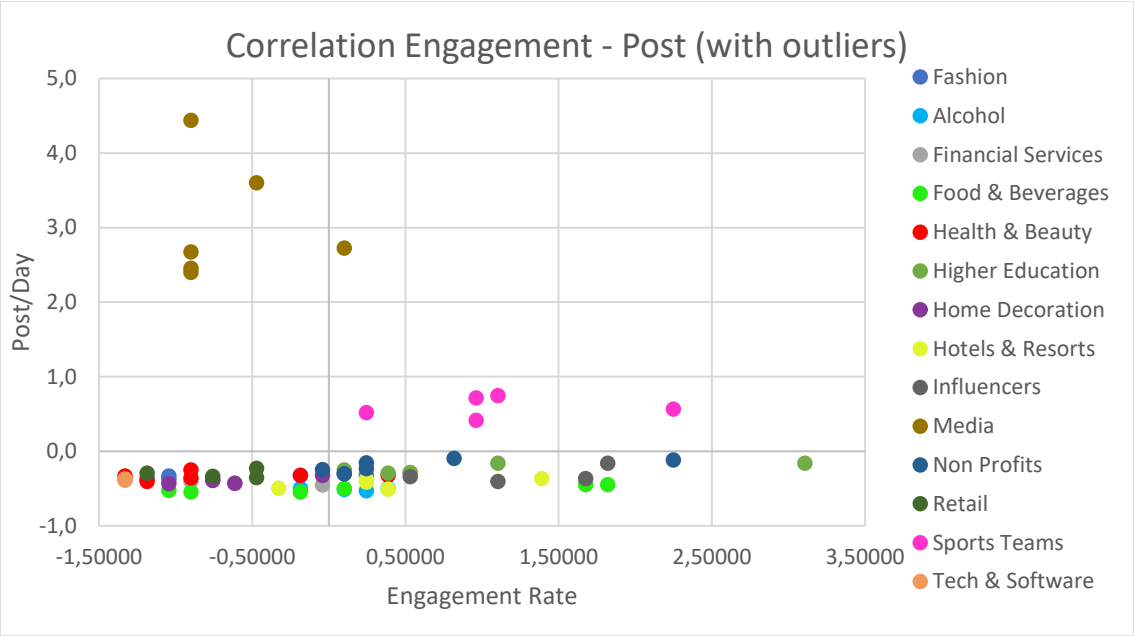


Source: Own Elaboration

In this instance, it can be shown that the majority of industries have a clear, consistent trend that has persisted throughout the years. Nearly all of them show up at positions close to one another. The evolution of the years has little effect on their behavior. On the contrary, the Media industry presents a quite different behavior. Its posting frequency is well above the average, and while not all of their observations are regarded as outliers, taken collectively, it may be classified as an outlier industry to make further studies easier.

We can now go on to analyze how these two factors connect to one another. This can be seen in graph 12.

Graph 12. Correlation Engagement-Post (with outliers).



Source: Own Elaboration

It is evident from this correlation graph that the Media behaves quite differently from other businesses. The other sector with a good rating for posting frequency is the Sports Teams sector. The remaining industries convert into comparable value ranges. In order to categorize these other industries, it would be interesting to create a minor contrast between them as we did before with the Instagram platform.

We went back to standardizing the original data without these two industries that were considered as outliers. This can be seen in table 4.

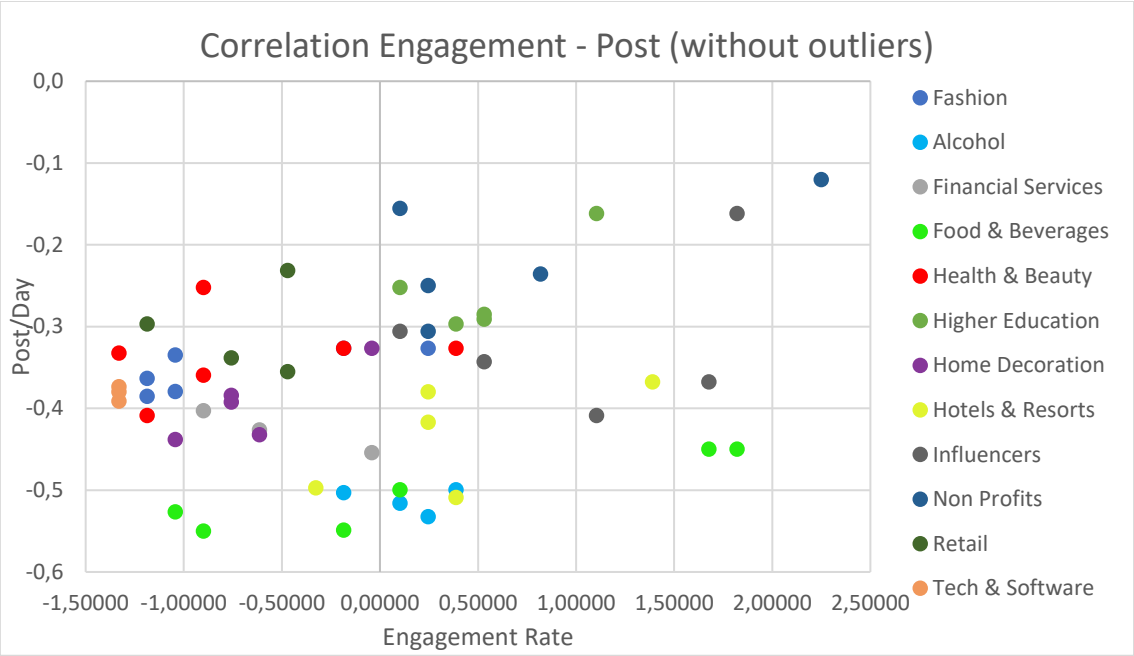
Table 4. Standardized data set in Excel-2.

YEAR	INDUSTRIES	Facebook Stand. Engagement Data	Facebook Stand. Frequency
2017	Fashion	0,27344	-0,1
2017	Food & Beverage	1,71387	-0,3
2017	Health & Beauty	0,41748	-0,1
2017	Higher Education	3,15430	0,3
2017	Non Profits	2,29004	0,3

Source: Own Elaboration

We redid the correlation graph to examine the distribution of the data and see if any patterns can be found. This can be seen in graph 13.

Graph 13. Correlation Engagement-Post (without outliers).



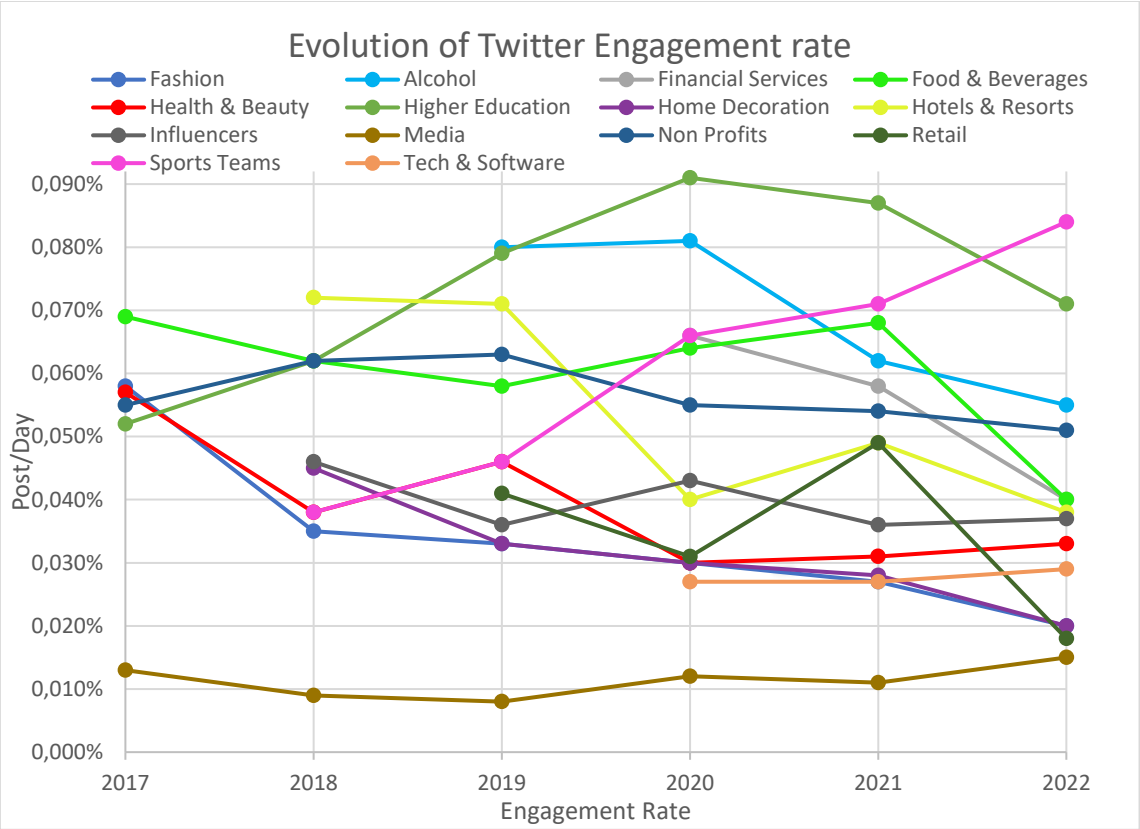
Source: Own Elaboration

The remaining industries on this graph may be seen more clearly, which makes it easier to categorize them into three groups. All industries that fall inside the first category would have positive engagement rates, above the x-axis, and positive post frequency, above the y-axis. We came across the Higher education and Non-Profit sectors. Second place is given to industries with below-average engagement rates but below-average daily post frequencies. The industries that fall into this category are Health & Beauty, Fashion, Home Decoration, Retail y Tech & Software. Finally, we would find industries that have more wildly varying engagement rates but consistently negative daily posts. The Food & Beverages, Hotels & Resorts, Alcohol, Influencers and Financial Services.

4.1.3 TWITTER PLATFORM

We will now talk about Twitter, which is the third social networking platform. We will use the same techniques and approaches as when we examined Facebook and Instagram. This can be seen in graph 14.

Graph 14. Evolution of Twitter Engagement Rate.

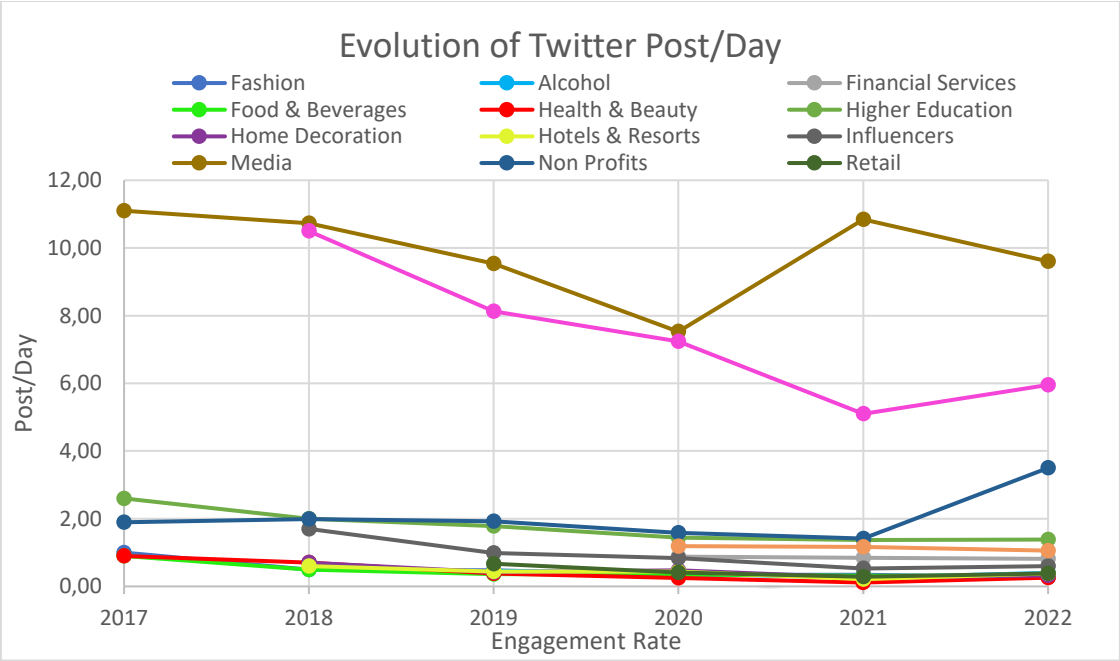


Source: Own Elaboration

Our observations of the Twitter social media network reveal a unique pattern of activity. There are undoubtedly certain sectors that enjoy growth over time, but then see a decline in the most recent year, and there are other industries whose trend is negative from start to finish. The two industries that operate differently are Sports Teams and Media. The former exhibits a more consistent trend over time whereas the second exhibits a positive trend over time. The amount of involvement on Twitter is obviously different from other platforms' levels, with significant moves and changes.

Second, we looked at the growth in Facebook post frequency (*Graph 15*).

Graph 15. Evolution of Twitter Post/Day.

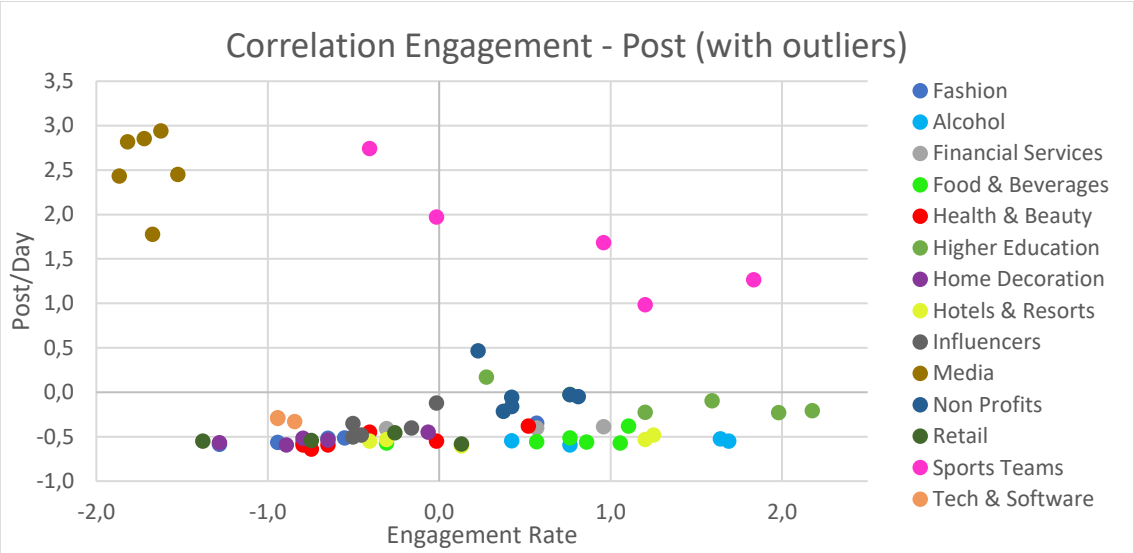


Source: Own Elaboration

In this case, it is evident that the majority of sectors have a unique, persistent tendency that has endured across time. They almost all appear at locations around the x-axis. The Media and Sports Teams industries, on the other hand, show a quite different behavior. Their posting frequency is far higher than the norm, and it is extremely comparable amongst them. Even while not all of their observations are considered outliers, when examined as a whole, they may be categorized as an outlier industry.

Now we can go on to evaluate how these two characteristics relate to one another. This can be seen in graph 16.

Graph 16. Correlation Engagement-Post (with outliers).



Source: Own Elaboration

This correlation graph makes it clear that the Media and Sports Teams act very differently from other companies. Along the x-axis, the remaining industries translate into equivalent groups. It would be intriguing to compare these other sectors in a simplified manner, much like we did with the Instagram and Facebook platforms. With these two industries removed as outliers, we resumed normalizing the original data (*Table 5*).

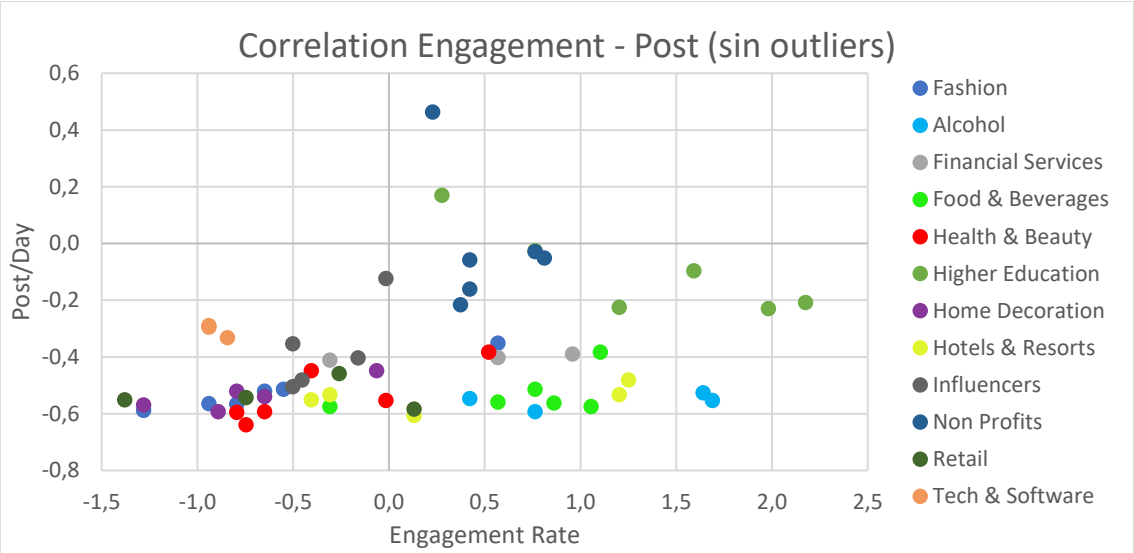
Table 5. Standardized data set in Excel-3.

YEAR	INDUSTRIES	Twitter Stand. Engagement Data	Twitter Stand. Frequency
2017	Fashion	0,51904	0,2
2017	Food & Beverage	1,12818	0,1
2017	Health & Beauty	0,46366	0,1
2017	Higher Education	0,18678	2,3
2017	Non Profits	0,13140	2,4

Source: Own Elaboration

We may revise the correlation graph to evaluate the distribution of the data and look for trends after normalizing and removing outliers from the data (*Graph 17*).

Graph 17. Correlation Engagement-Post (without outliers).



Source: Own Elaboration

This graph's surviving industries may be seen more clearly, making it easier to divide them into three categories. The first group would include all industries with a good engagement rate and a positive frequency of daily posts. As a result, this category includes the following industries: Higher Education and Non-Profits. The second group includes the industries that also have a high interaction rate but frequently post negative content. We came upon with Alcohol, Hotels & Resorts, Food & Beverages, and Financial Services. Finally, we group together all the industries that have a poor engagement rate and a low frequency of posts. We include, then, Retail, Health & Beauty, Fashion, Home Decoration, Influencers and Tech & Software which, although having positive post engagement, has a very low value and behaves more like the third group.

As a summary of this section 4.1, we provide three tables that group the sectors according to how they respond to the engagement rate and daily post frequency metrics. Each sector will only be a member of one group. According to the behavior that has been examined, there are therefore four alternative grades for the industries. The possible outcomes are as follow: a high value for both variables (engagement rate and frequency) in the first case; a low value for both variables in the second case; a high value for engagement and a low value for frequency or vice versa.

Table 6. Instagram industry classification.

INSTAGRAM PLATFORM		ENGAGEMENT RATE	
		HIGH	LOW
DAILY POSTING FREQUENCY	HIGH	Sports Teams Influencers	Health & Beauty Fashion Media Retail
	LOW	Higher Education Non-Profits Food & Beverages Alcohol	Home Decoration Financial Services Hotels & Resorts Tech & Software

Source: Own Elaboration

Table 7. Facebook industry classification.

FACEBOOK PLATFORM		ENGAGEMENT RATE	
		HIGH	LOW
DAILY POSTING FREQUENCY	HIGH	Sports Teams Non Profits	Home Decoration
	LOW	Media Alcohol Food & Beverages Hotels & Resorts Influencers Higher Education	Fashion Financial Services Health & Beauty Retail Tech & Software

Source: Own Elaboration

Table 8. Twitter industry classification.

TWITTER PLATFORM		ENGAGEMENT RATE	
		HIGH	LOW
DAILY POSTING FREQUENCY	HIGH	Sports Teams Non-Profits Higher Education Financial Services	Media Tech & Software Influencers
	LOW	Alcohol Food & Beverages Hotels & Resorts	Fashion Health & Beauty Home Decoration Retail

Source: Own Elaboration

The tables 6, 7 and 8 demonstrate how each sector behaves differently based on the platform. There are occasionally coincidences. For instance, Higher Education and Non-Profits exhibits a high engagement value in the three platforms, while Sports Teams exhibits both a high frequency of postings and high level of engagement in all three. However, there are industries such as Health & Beauty, Fashion and Home Decoration that show low level of engagement in the three platform which can be intriguing. There are similar circumstances and characteristics shared by the other industries, although they are not strictly met by all platforms. For instance, the Influencers industry has a high engagement value on Facebook and Instagram, while its primary attribute on Twitter is a low frequency value.

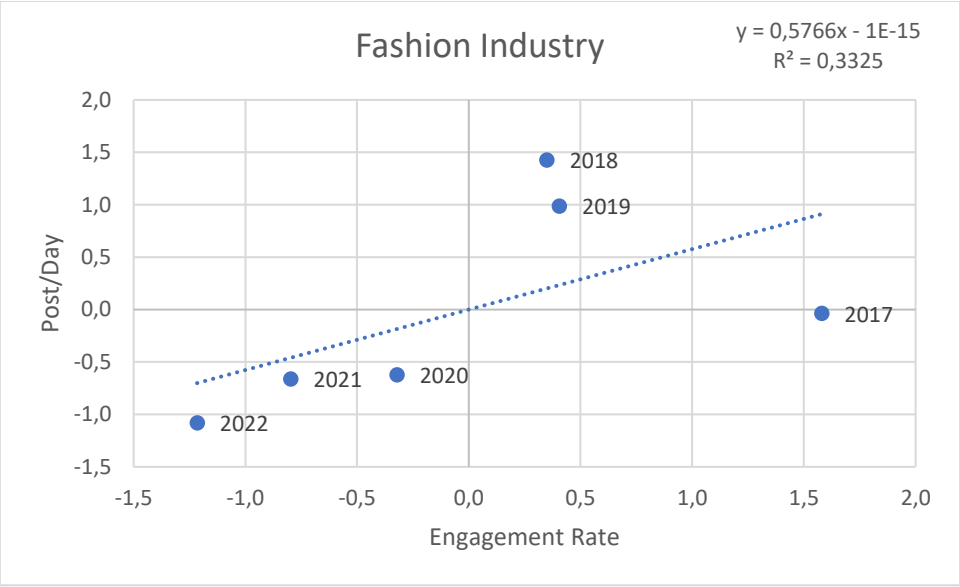
4.2 INDUSTRY SPECIFIC ANALYSIS

4.2.1 INSTAGRAM STUDY

In this second part of the analysis, we continue by thoroughly outlining the distinctive behavior of each industry. To do this, we standardize the data for each sector independently. The graphics showing the correlation between the two variables by industry were produced using R Studio. The numerical value of this correlation has also been obtained and so does the R^2score. This was done by applying a linear trend to each industry in order to see the evolution of the industry and avoid any possible biased behavior. As the data collected is only for a period of time of 6 years, it is important to notice that if we apply a polynomial trend, it will affect the study as we will get extremely high values of R^2 for some industries.

The Fashion business is the first to be examined, and the results indicate a R^2score of 0.3325. Having a positive R^2value means that as engagement increases, frequent posts increase as well, and when one decreases, the other decreases. During the first years, the engagement rate is seen to be positive and so does the frequency of posts. Nevertheless, from 2020 to 2022, both variables show negative values, reaching the lowest scores in the last year. This cannot be seen for the year 2017 because there were practically no posts that year and the industry-wide interaction rate was the highest it has ever been. In fact, if we take out the observation from 2017, the R^2value increases to 0.8716, proving that there has been a positive trend among the variables and this industry for the last period of time. This can be seen in graph 18.

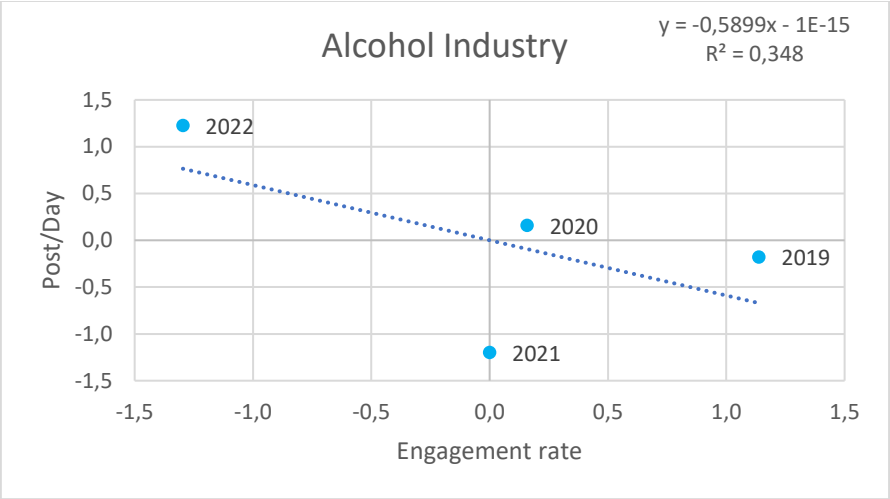
Graph 18. Fashion industry Instagram correlation.



Source: Own Elaboration

Results for the Alcohol sector display a R^2 score of 0,348. This supports the presence of a positive evolution between the variables; however, it is quite small given the low value. The graph analysis reveals that the post frequency values near to zero result in the highest levels of engagement, which is noteworthy since it contradicts the idea that there is a positive association between the variables. This can be seen in the year 2022 when the maximum posts are done but the minimum engagement is achieved. The degree of engagement that is created, though, drastically is reduced as the number of posts rises. This demonstrates that while the link between the variables is positive in terms of strength, it is negative in terms of direction. This can be seen in graph 19.

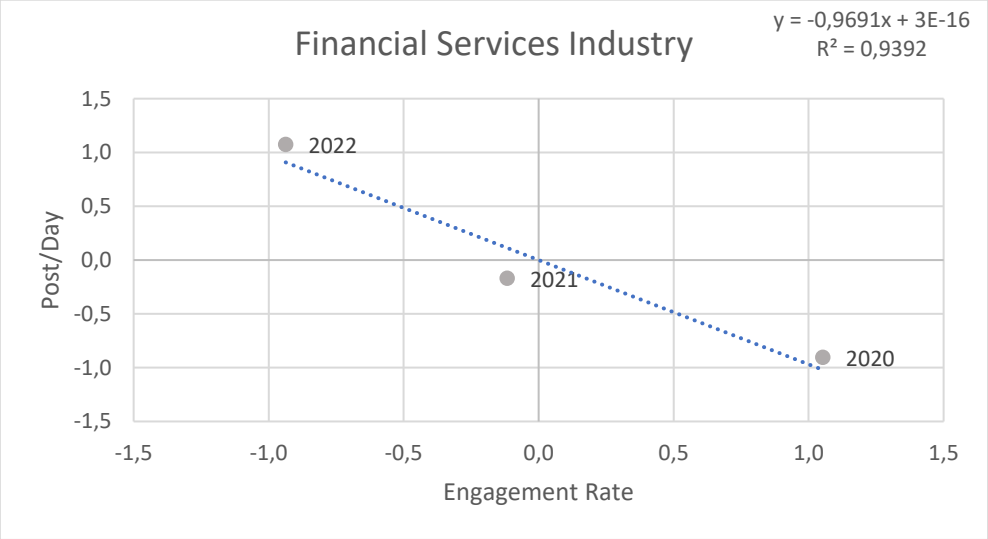
Graph 19. Alcohol industry Instagram correlation.



Source: Own Elaboration

The Financial Services industry's correlation coefficient is 0,9392, indicating almost a perfect relationship between the two variables. The direction between the variables, however, is negative, meaning that the industry will benefit from fewer posts as this would lead to higher participation among users. This is clearly shown in the year 2020 when engagement is quite high, but the number of postings is significantly lower. The opposite occurs in the year 2022 when the engagement rate is at its lowest value but the highest frequency. This can be seen in graph 20.

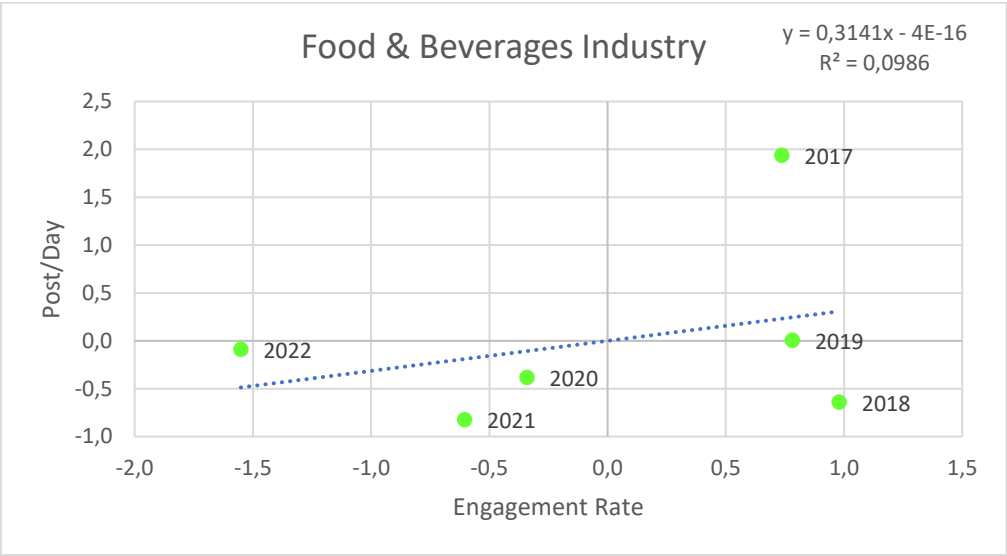
Graph 20. Financial Services industry Instagram correlation.



Source: Own Elaboration

According to the findings for the Food & Beverages sector, the R^2 value is 0.0986. Changes in one variable do not reflect changes in the other due to the almost non-existent relationship between the variables. The graph demonstrates, however, that after the first year, the behavior tends to stabilize for the quantity of messages, attaining values near to 0. The engagement rate is affected by a total of 3 points, which suggests that engagement may have been impacted by external factors that were not considered in this study. This can be seen in graph 21.

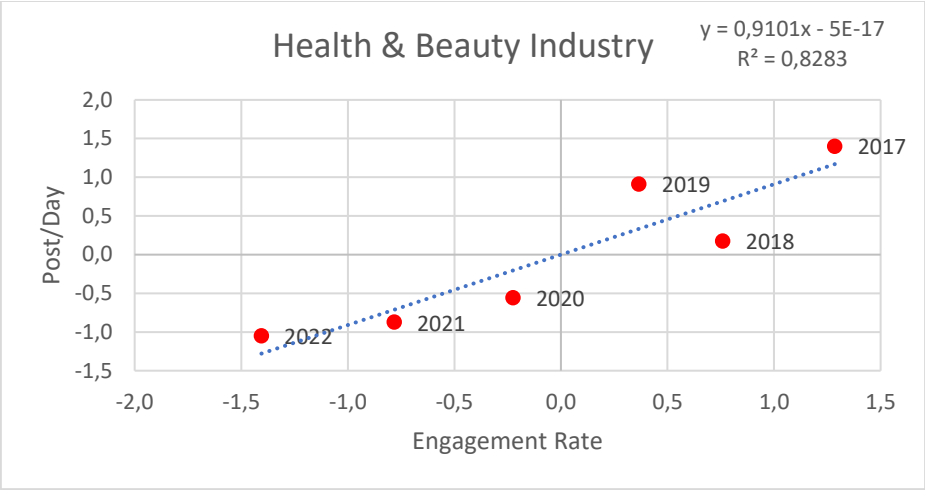
Graph 21. Food & Beverages industry Instagram correlation.



Source: Own Elaboration

The R^2 of the Health & Beauty industry result is rather high with a score of 0,8283. The data for the first three years show in the upper right quadrant, suggests a strong association between the variables, however from 2020 forward, this behavior decreases and is totally inverted, indicating a clearly negative evolution of the industry. The observations are arranged in the bottom left quadrant, indicating that the industry is publishing much less frequently, which affects how much engagement it creates. This can be seen in graph 22.

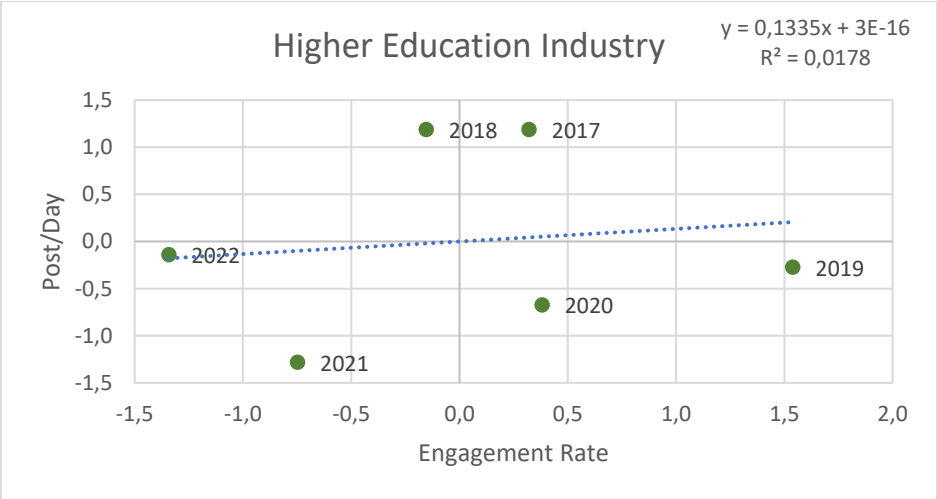
Graph 22. Health & Beauty industry Instagram correlation.



Source: Own Elaboration

The Higher Education sector has a score of $R^2$of 0.0178, which suggests that the association between the variables is poor. The graph demonstrates that over the first two years, there were an excessively high number of advertisements and a relatively low level of industry engagement. However, this is different during the following years when there are hardly any posts. The number of postings was almost the same in 2019 and 2022, but interaction decreased by almost two full points in 2022, which is intriguing and thus important. This can be seen in graph 23.

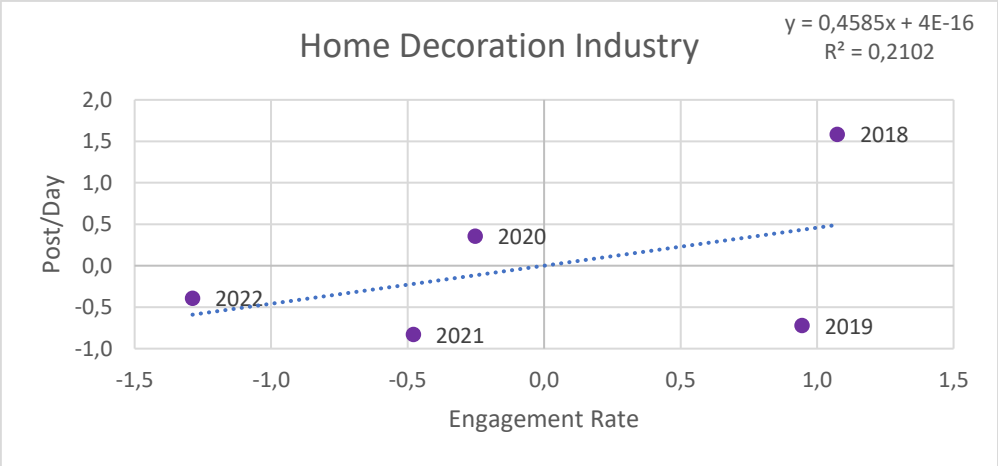
Graph 23. Higher Education industry Instagram correlation.



Source: Own Elaboration

The Home Decoration sector shows a R^2 score of 0.2102. This industry shows a considerable decline in involvement as time goes on, but surprisingly, it displays a different behavior for the frequency variable. The number of posts in 2019 and 2021 was nearly identical, although the interaction has been cut in half by that time (*Graph 24*).

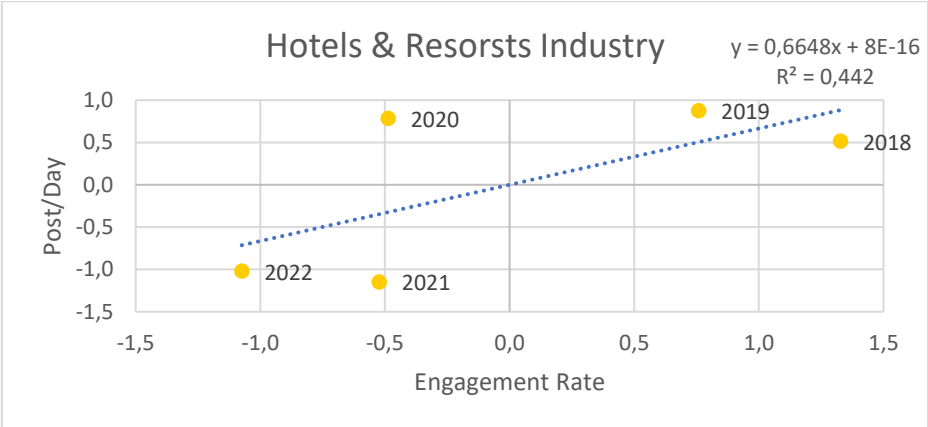
Graph 24. Home Decoration industry Instagram correlation.



Source: Own Elaboration

The trend line for the Hotels & Resorts industry has a correlation value of 0.442. It is a sector where observations are dispersed and diverse. The number of postings and interaction rate were both strong throughout the first two years. In 2020 appears to be a turning point when posting frequency is consistent with prior years but the level of engagement produced is significantly lower. This can be seen in graph 25.

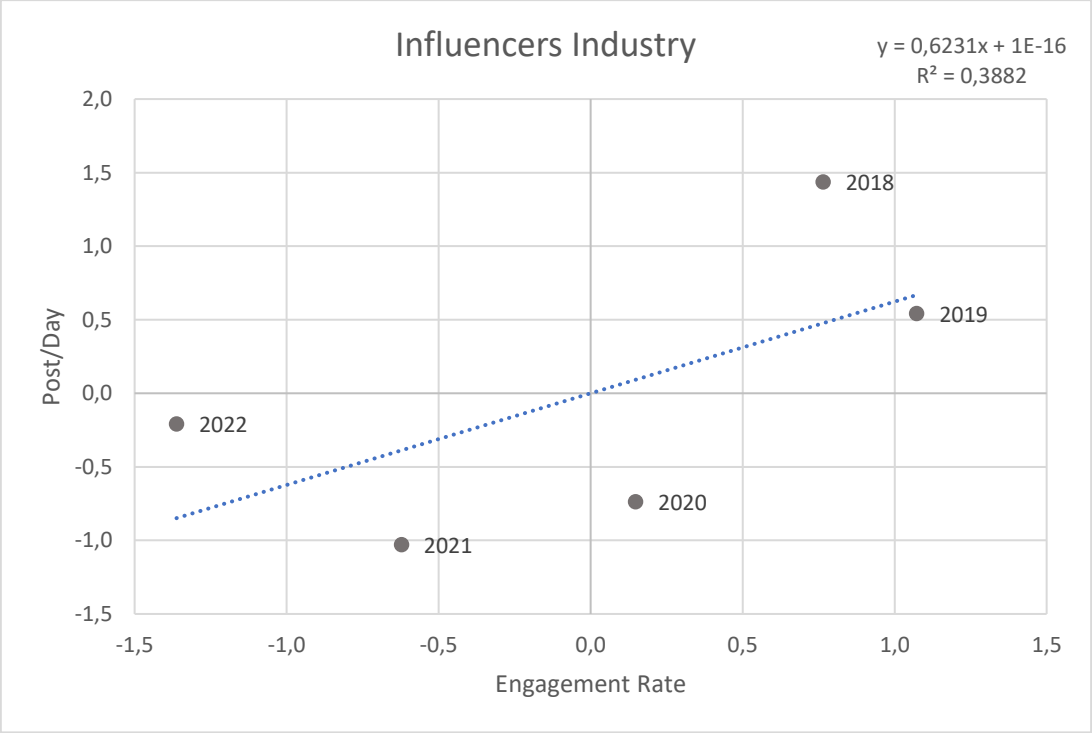
Graph 25. Hotels & Resorts industry Instagram correlation.



Source: Own Elaboration

In the Influencers sector, the relationship between post frequency and engagement rate has a R^2 value of 0.3882. When analyzing the graph, the first two years demonstrate a high volume of postings as well as the highest levels of industry interaction. The posting frequency has significantly decreased over the past several years, which has had a detrimental impact on the level of engagement. This can be seen in graph 26.

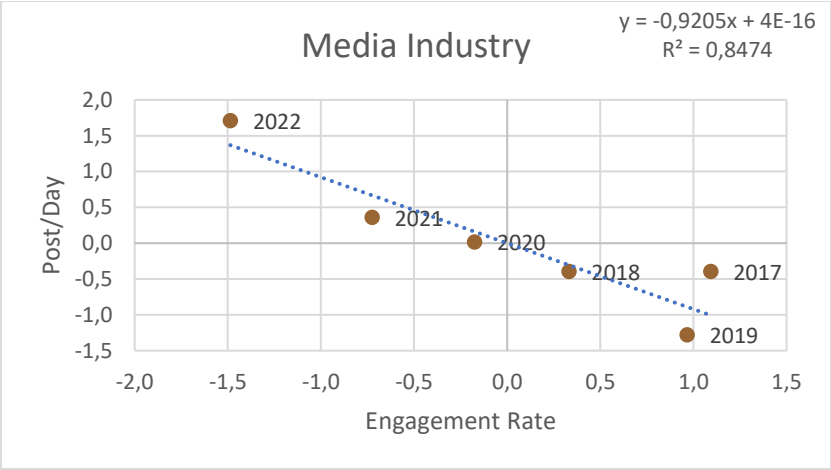
Graph 26. Influencers industry Instagram correlation.



Source: Own Elaboration

The relationship between engagement rate and publication regularity in the Media sector has a R^2 value of 0.85. The direction of the relation is negative. When the frequency of posting changes, the engagement rate changes as well, showing that there is a very strong connection between the variables. In this instance, the majority of the variation in the engagement rate can be described by the variation in the frequency of posting. Engagement is seen between 0.5 and 1 during the first three years, with below normal post values. However, this trend reverses during the following years, with above-average post frequency and negative engagement values. This can be seen in graph 27.

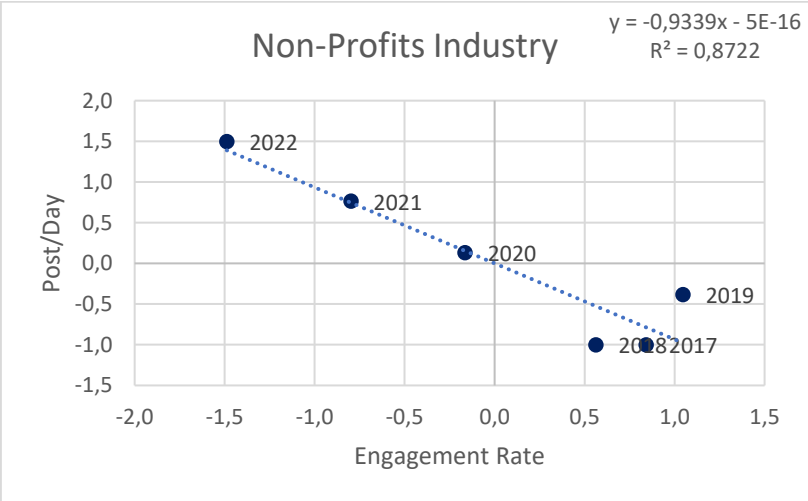
Graph 27. Media industry Instagram correlation.



Source: Own Elaboration

The Non-Profit sector has a correlation of 0.8722. This value states that the relationship between the two variables is high but it is also with a negative direction. That is, when one goes up, the other goes down and vice versa. With relatively modest levels of publishing, engagement has been significant in the first three years. The tendency changed in the last years though, with a high frequency of publishing but a low degree of participation, starting in 2020. In fact, the engagement rate is at its lowest and the frequency of posts is at its greatest in 2022. This can be seen in graph 28.

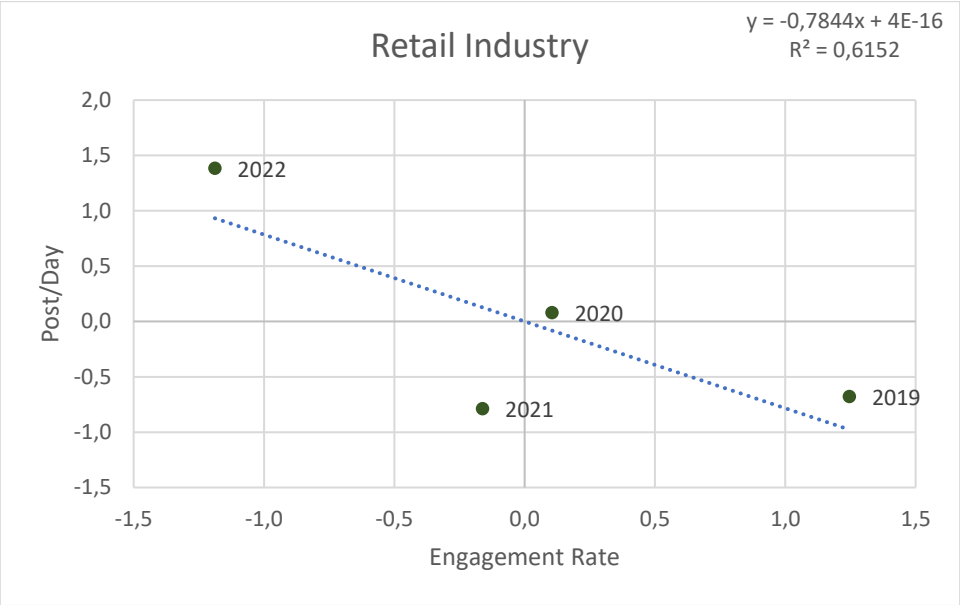
Graph 28. Non-Profits industry Instagram correlation.



Source: Own Elaboration

The association coefficient for the Retail industry is 0.6152, suggesting that there is a discernible interaction between the factors. In this instance, it works the same way as it does in the sector just stated above, meaning that the sector gains when posting infrequently because this encourages greater user interaction. This is demonstrated in 2019, when interaction is high but posting volume is low and below the norm. However, as time goes on, this behavior shifts because engagement decreases the more the business shares. This can be seen in graph 29.

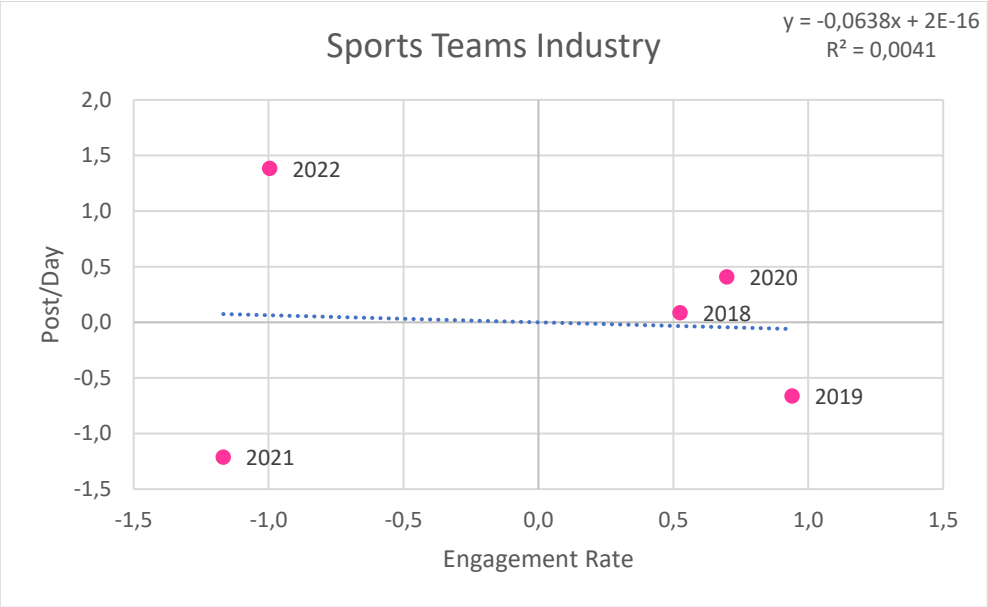
Graph 29. Retail industry Instagram correlation.



Source: Own Elaboration

The R^2 value for the Sports Teams sector is 0,0041. The result shows that the association between the two factors is extremely low. In other words, the amount of interaction a post receives on social media is largely unrelated to how frequently it is posted, and the majority of the variance in engagement rate cannot be attributed to variations in post frequency. It is clear that throughout the first three years, the sector posted not much and garner a considerable amount of interaction. However, both indicators drastically decline in 2021, reaching their lowest values for both the engagement and the posting. It is deducted that the industry did try to change this in 2022 by dramatically expanding the number of postings with the highest value of the sector. However, this does not result in a significant increase in user engagement. In fact, over the first three years, there are roughly twice as many engagements as there were this past year (*Graph 30*).

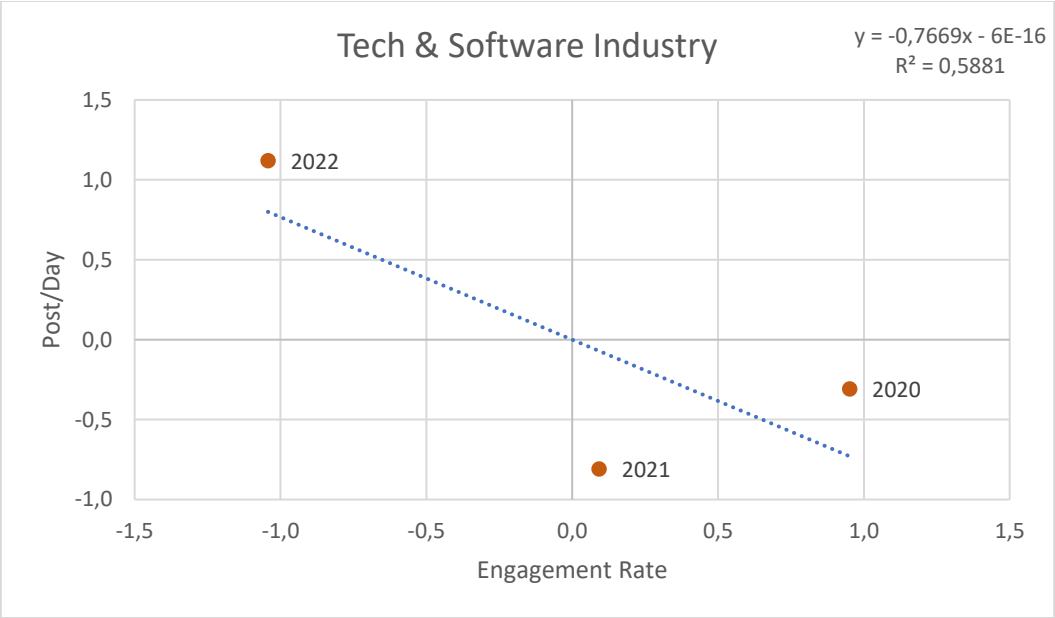
Graph 30. Sports Teams industry Instagram correlation.



Source: Own Elaboration

The Tech & Software industry's correlation coefficient is 0,5881. This value indicates that there is a moderately strong correlation between the two variables. In this case, the direction is also negative as we have seen in other industries before, meaning that the industry will benefit from fewer posts as this would lead to higher engagement rate. This is seen in 2020 when engagement is quite high, but the number of postings is significantly lower, falling below the median. The opposite occurs in 2022 when the engagement rate is at its lowest value but the highest frequency. This can be seen in graph 31.

Graph 31. Tech & Software industry Instagram correlation.



Source: Own Elaboration

After analyzing the fourteen Instagram verticals, we have learned that sometimes the relationship can be strong and positive, meaning that when one variable rises, the other rises as well; at other times, it can be strong and negative, meaning that when one variable rises, the other decreases; and at other times, the relationship can be almost imperceptible, in which case we should investigate other variables to find a pattern of influence. It was decided that the relationship between the variables was not powerful enough in the instance of an industry with a R^2 value of less than 0.4, and it is advised that other interactions should be examined. In other words, the threshold chosen was 0,4. With this in mind, we will construct three subsets of data from those industries that show similar behaviors and three more graphs analyzing the R^2 value for each of the groups.

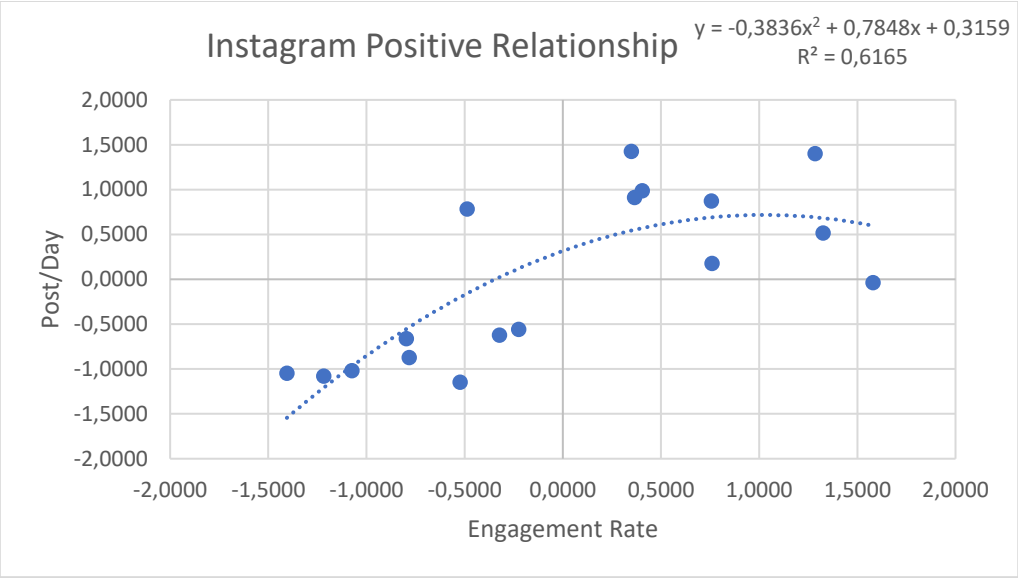
Within the first group, with a positive and strong relationship between variables, we find the Fashion, Health & Beauty, and Hotels & Resorts industries. This can be seen in graph 32. When analyzing the data, we find that the R^2 values under a linear trend line and a second-degree polynomial are not as high as when analyzed individually showing values of 0.51 and 0.61, respectively. These sectors discuss related subjects, publish frequently, and employ related marketing techniques. These shared traits may result in a comparable interaction rate and posting frequency pattern, which would account for the similar

R^2 values. It is crucial to remember that grouping sectors with comparable R^2 does not imply that businesses within those industries will behave consistently in terms of engagement rate and regularity of posting. There is always a chance that some businesses in a given sector will diverge from the norm, which could have an impact on the R^2 .

More similarities and traits are shared by these sectors. They all put a strong emphasis on providing customers with an excellent and gratifying encounter and aim to provide exceptional client experiences. As they are all focused on the image they produce, they are also considering aesthetics and graphics. Clothing and accoutrements for the Fashion industry must be attractive, while goods and treatments for Health & Beauty are intended to enhance people's appearance. For Hotels & Resorts, design and decoration are essential elements to draw visitors. Additionally, identity and the image that each of the three sectors projects are extremely important. In these fields, reputation and status are also essential.

Moreover, industries with a positive relationship show that it is possible to increase the engagement rate with a higher number of posts. It is easier to increase engagement in businesses that have a wider range of products, as they can put different posts about different products being more present on the Instagram page of the consumers and following the rules that govern today (such as fast fashion). In the same way, as these are cheaper products, it is more interesting to use marketing to draw conclusions and create consumer profiles and therefore make more personalized offers. However, there comes a point where this engagement growth can no longer be improved, and it can be even reduced. This is because users have a limit, and they should not be overwhelmed with posts.

Graph 32. Instagram Top Players.



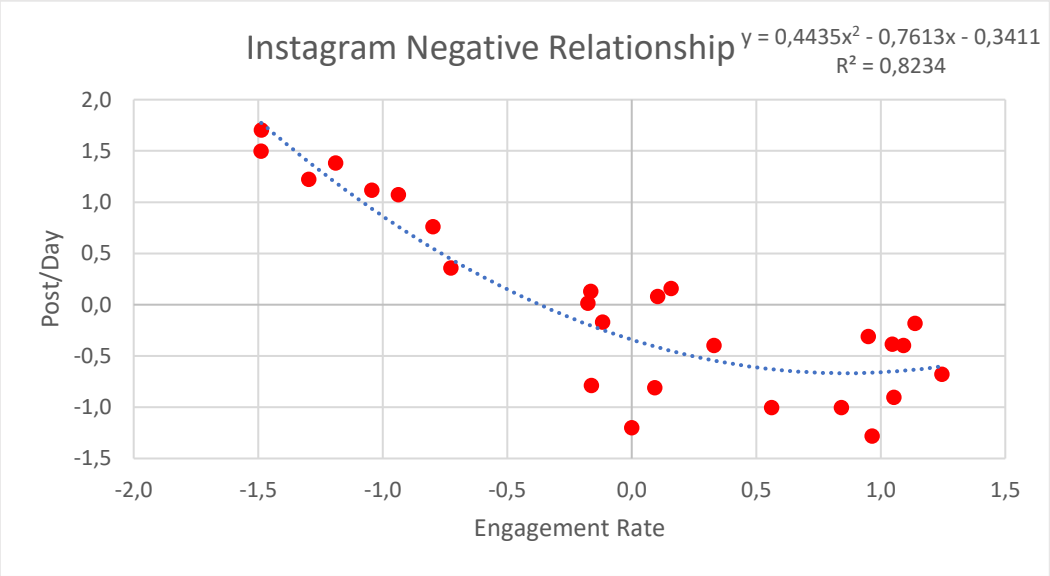
Source: Own Elaboration

In the second group, with a strong negative relationship, we find the Alcohol, Media, Non-Profits, Financial Services, Retail and Tech & Software industries. It is normal to receive a comparable R^2 due to the clustering of industries with similar traits and behavior patterns. The findings support the claim that there is a comparable relationship and impact between the variables in these sectors. This can be seen in graph 33. It is interesting that these industries, which are considered to be quite disparate in terms of the audiences they reach and consumer tastes, exhibit such similar behavior. However, there are some characteristics and attributes that the sectors have in common, such as the necessity of continuous adaptation, the emphasis on technology, and the impacts they have on society. To stay current and satisfy the evolving requirements of their users and customers, these sectors must constantly adapt and develop. Technology is constantly changing, and businesses that do not successfully adopt it risk falling behind their competitors. In all of these sectors, technology is becoming increasingly crucial for creativity and efficiency. Companies are conscious of their social effect and work to make a good difference. For instance, Non-Profit organizations actively work to improve society, whereas Retail and Finance organizations may create CSR initiatives to support significant causes.

This can also be explained because the majority of the goods and services provided in these sectors are more expensive and are consumed less frequently and impulsively. In

addition, the range of products is much smaller. This is why it is interesting for these industries to concentrate the information in a few posts so that they do generate engagement. It is not interesting to put a high number of posts saying the same thing about the same product. It is better to make a single post with concise information and put it at the right times.

Graph 33. Instagram Worst Players.



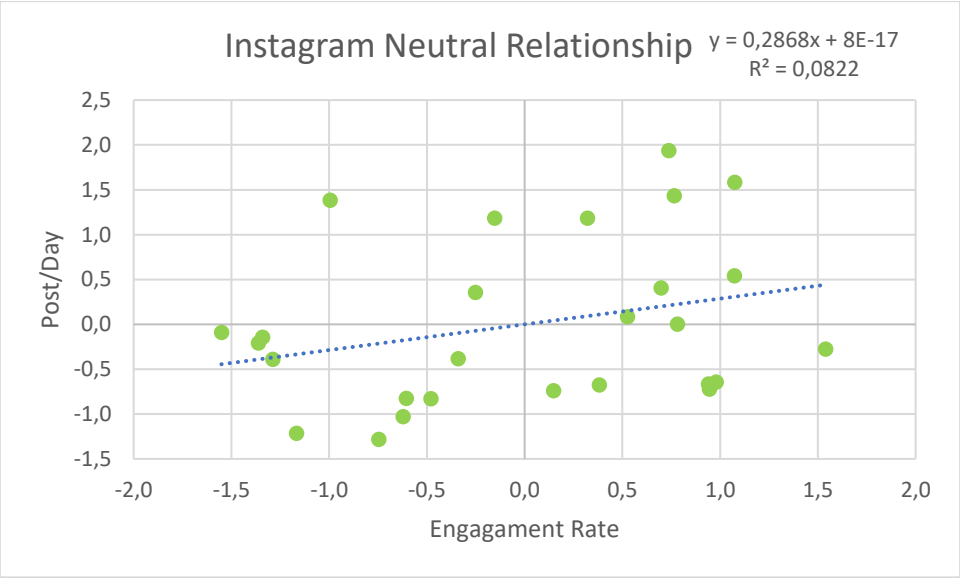
Source: Own Elaboration

Finally, in the group where there is no relationship between variables, we find the Food & Beverages, Higher Education, Home Decoration, Influencers and Sports Teams industries. The R^2 number computed using a linear trend line is 0.0822, and it is the same when using a polynomial trend line of degree 2. It is evident from this image that there is a spread among the four quadrants, making it nearly impossible to detect a pattern. This can be seen in graph 34. The consumer's highly individual taste as well as the substance, emotion, and sense of belonging that each industry is capable of producing have a significant impact on these sectors. Demonstrating a connection between the two variables is therefore more challenging.

The consumer lifestyle, the tendency toward customization, and the emphasis on customer experience are some of the commonalities and traits that the Food & Beverages, Higher Education, Home Decoration, Influencers, and Sports Teams sectors have in common. Lifestyle and individual tastes are the focus of these sectors as they have an

impact on all of these choices, including the food and beverages they ingest, the education they receive, how they decorate their homes, who they follow on social media, and which sports teams they support. Because of this, businesses in these sectors strive to provide consumers with specialized goods and services that are catered to their individual requirements. For instance, the home furnishings industry offers tailored solutions for each customer's house, whereas the higher education sector offers tailored study plans for each student.

Graph 34. Instagram Random Players.



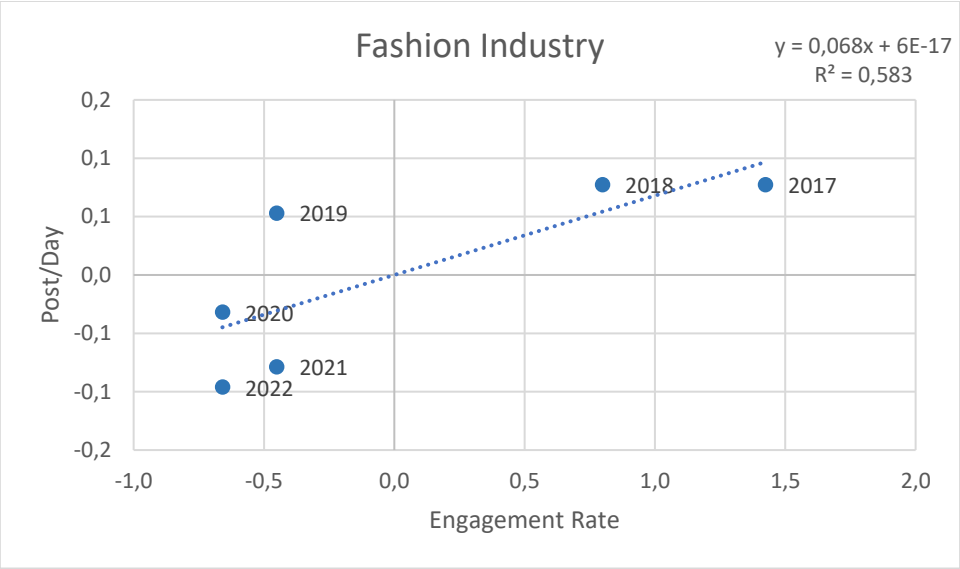
Source: Own Elaboration

4.2.2 FACEBOOK STUDY

We will now do the identical study on the Facebook platform as we did for the Instagram platform.

The Fashion sector is also the first industry being examined in this situation. The R^2 for was 0,583, which is not particularly impressive. The relationship in this industry has a positive evolution which implies that a rise in the quantity of social media posts is associated with a rise in the contact and involvement of followers. The conclusion after analyzing the graph is that the industry initially blogged rather often, leading to high user engagement rates. Nevertheless, this evolves with time. The engagement rate and posting frequency significantly decrease, reaching their lowest values in 2022 for both variables. This can be seen in graph 35.

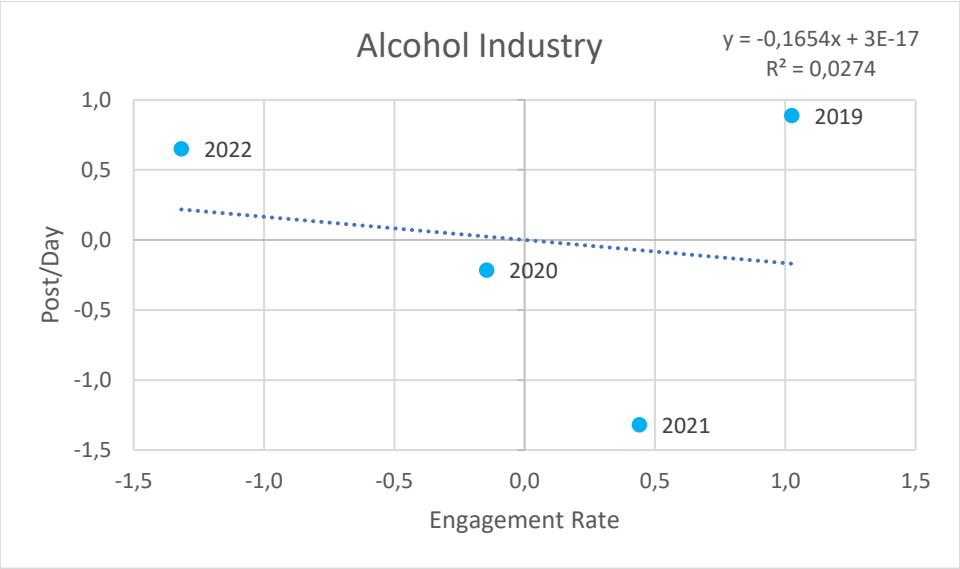
Graph 35. Fashion industry Facebook correlation.



Source: Own Elaboration

The Alcohol business is represented by a R^2 score of 0,0274. This indicates there is either no link at all or a very weak one. This also implies that altering one variable has no impact on the other. This might be as a result of the numerous limitations the booze industry places on the promoting and marketing of its goods, which prevent businesses from increasing post frequency and, consequently, interaction rate. This could restrict how much the regularity of posts affects interaction rates and make it harder for this sector to improve user engagement since they have to find new ways to motivate people to consume the product. The graph demonstrates how each year's activity is different, with entirely different engagement and posting metrics. This can be seen in graph 36.

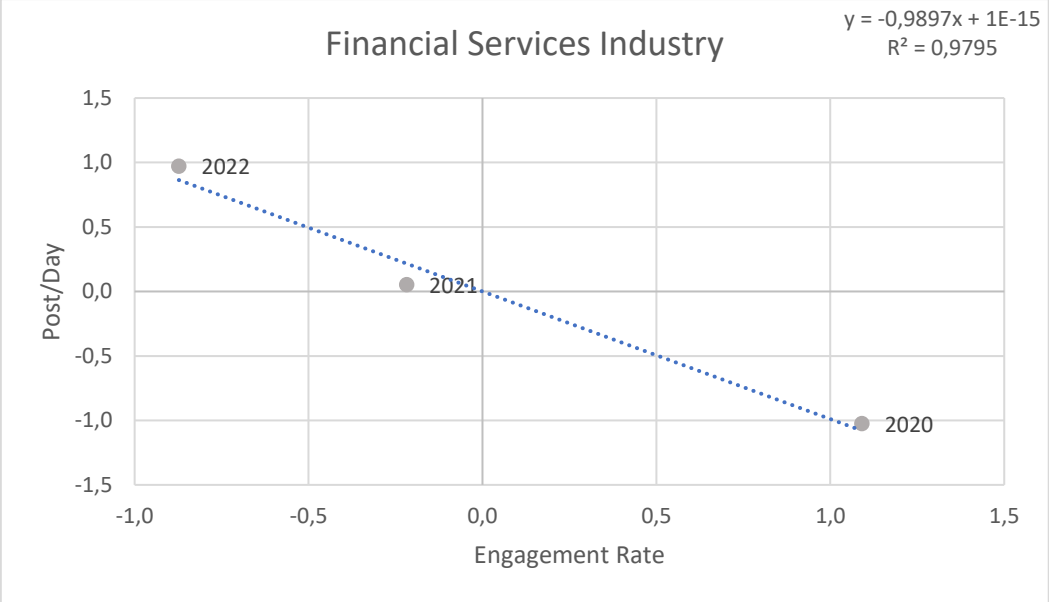
Graph 36. Alcohol industry Facebook correlation.



Source: Own Elaboration

Financial Services industry has a correlation of 0,9795 which indicates that there is almost a perfect correlation between the variables. However, the direction of the relationship is negative such that if one grows, the other decreases. In 2020, engagement is strong but posting frequency is low, and in 2022, the reverse pattern is observed (*Graph 37*).

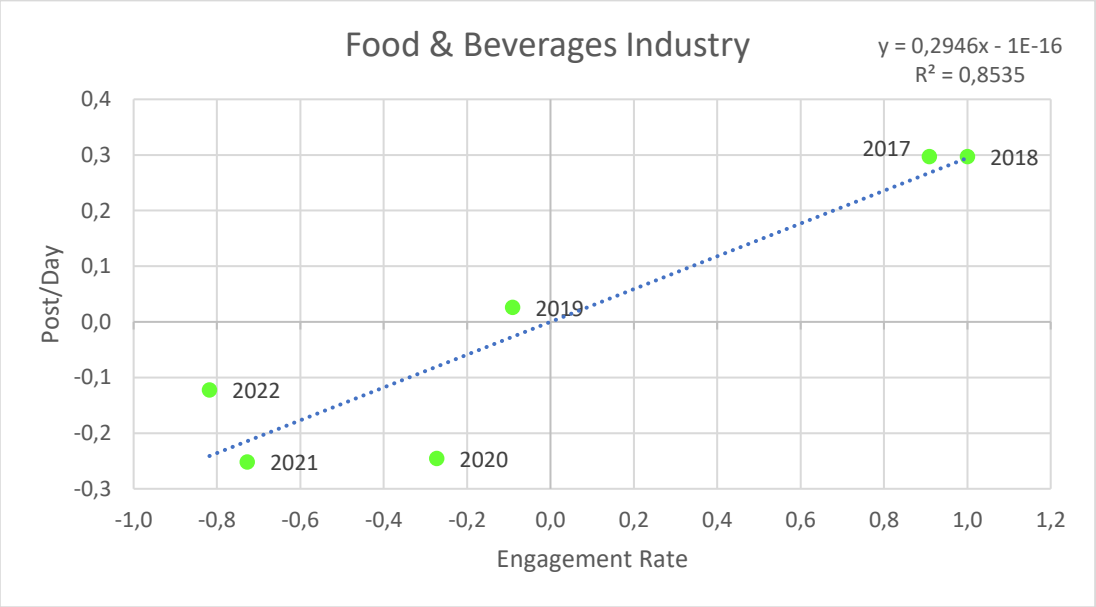
Graph 37. Financial Services industry Facebook correlation.



Source: Own Elaboration

In the Food & Beverages industry, a positive value correlation of 0.8535 is observed. The sector shows a very high connection between interaction rate and post frequency. Companies may have a better ability to produce aesthetically appealing and varied content in the food and beverages business, where the visual presentation of goods can be very essential. This can increase engagement rate when shared more frequently. During the first years, the industry produced a lot of engagement and posts and then the last years, it adopted a more cautious stance, reducing considerable the numbers of both variables. This can be seen in graph 38.

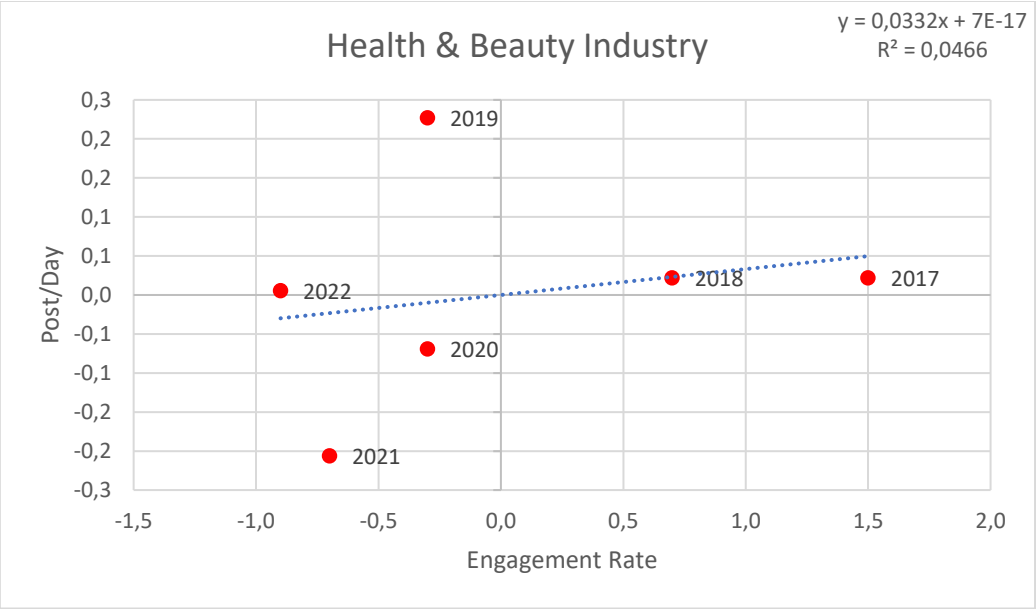
Graph 38. Food & Beverages industry Facebook correlation.



Source: Own Elaboration

Engagement rate and publication frequency in the Health & Beauty sector have a R^2 value of 0.046, which indicates that there is either no connection at all or a very weak one. This might be due to the intense competition in the sector, where many businesses vie for customers' notice on social media. The ability of post frequency to affect interaction rate may be constrained by followers' preferences for instructional, informative, or generally more lifestyle and health centered content. When analyzing the graph, the market also shows how the frequency of posts decreases significantly with time, which affects the degree of engagement. In fact, the level of posting in 2017 and 2022 is almost the same but the engagement rate generated is 2.5 points down. Nevertheless, as values are so dispersed in the period of time studied, there is no observable pattern (*Graph 39*).

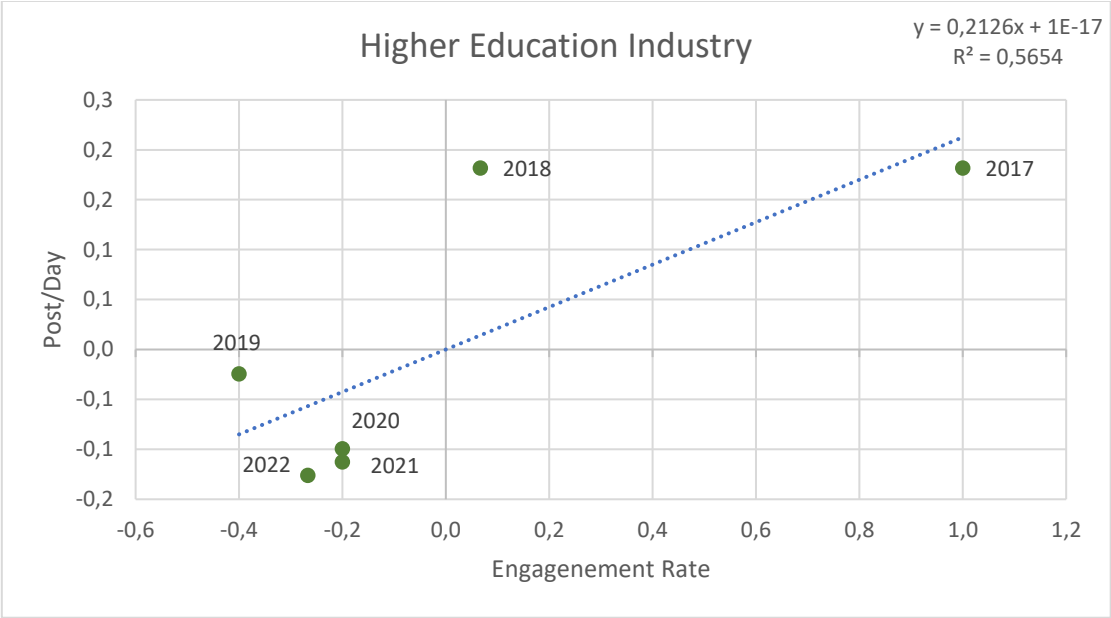
Graph 39. Health & Beauty industry Facebook correlation.



Source: Own Elaboration

A moderate value of 0,5654 R^2 is displayed for the Higher Education sector. As can be seen from the graph, the relationship has a positive sign, — in other words, as one variable rises, the other rises as well, and vice versa. However, the evolution the industry took is not in its favor. In comparison to the early years, both engagement and posting frequency have significantly decreased in the last year. In fact, in 2017 the engagement rate had the highest value for both variables and somewhat it considerably decreased reaching pretty low values in the two variables. This can be seen in graph 40.

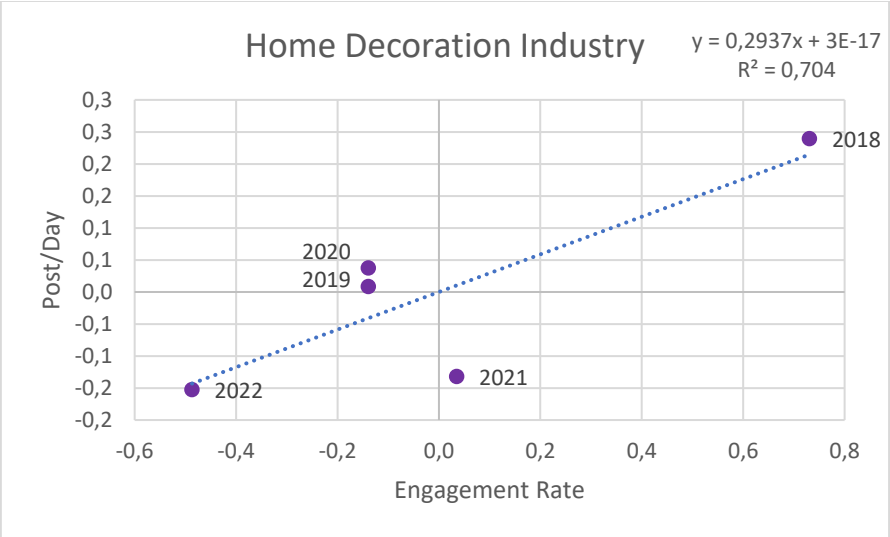
Graph 40. Higher Education industry Facebook correlation.



Source: Own Elaboration

In the industry of Home Decoration, there is a substantial positive value association of 0.704. Here, we can observe a pattern of behavior resembling that of the prior industry, wherein the first year of study data showed high values for both variables, but in the subsequent years of research, this changed and the values for both variables became negative. The fact that the variables' values in 2019 and 2020 were eerily near to 0, and that there was a significant decline from the prior year, is also curious. The worst observation, with the lowest number for both factors, is in 2022, according to the findings. This can be seen in graph 41.

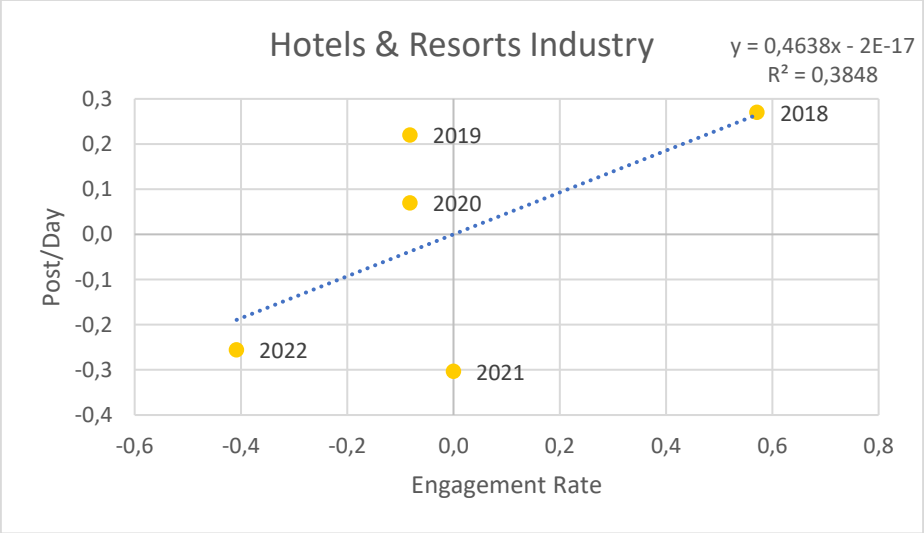
Graph 41. Home Decorations industry Facebook correlation.



Source: Own Elaboration

Hotels & Resorts displays a R^2 value of 0.3848. This enables us to claim that although there is a weak association between the variables, it can be inferred that when one grows, the other does as well. This is valid at least for the specific years 2018 and 2022. For the years in between, a more distinct behavior pattern is shown, indicating in all cases a comparable level of involvement that is very near to zero but varying each year in terms of the number of postings. This can be seen in graph 42.

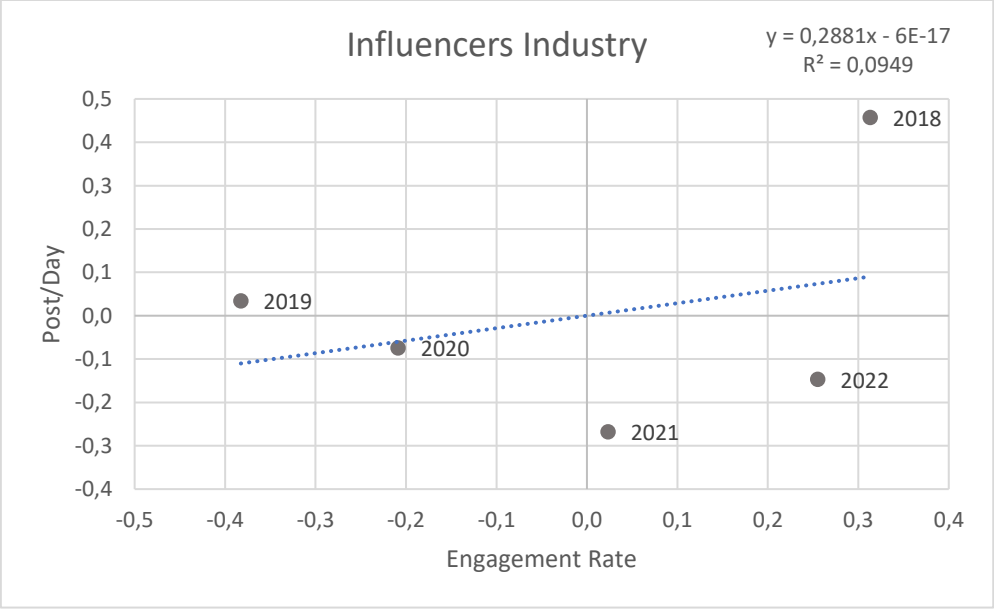
Graph 42. Hotels & Resorts industry Facebook correlation.



Source: Own Elaboration

Engagement rate and post regularity for the Influencer business have a R^2 value of 0.09, which indicates a weak to non-existent correlation between the two factors in this sector. Publishing frequently may not be as crucial in the influencer sector as content authenticity and quality. Overproduction of content may detract from creativity because followers may have high standards for original, high-quality content that is tailored to their interests. When analyzing the graph, it is seen that there is no easy observable pattern in the industry. However, if we take the period from 2019 to 2022, it is seen that the number of daily posts is more or less the same but that the engagement rate changes almost a full point, reaching more interested users in the end of the period (*Graph 43*).

Graph 43. Influencers industry Facebook correlation.

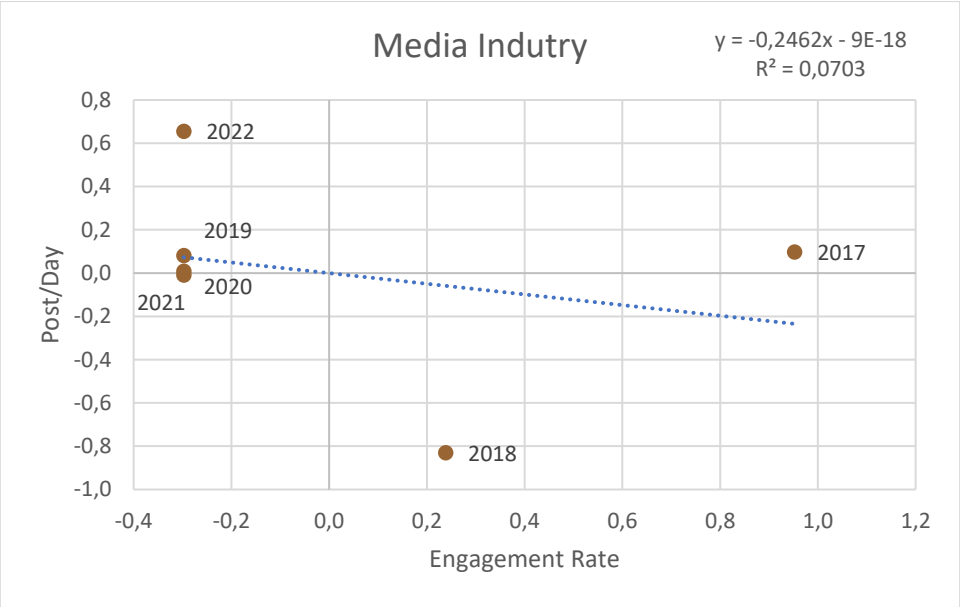


Source: Own Elaboration

Engagement rate and post frequency for the Media business on Facebook have a R^2 value of 0.0704, which indicates a weak to no association between the variables in this sector. In other words, a substantial rise in the engagement rate will not definitely follow from posting more frequently on Facebook. This might be the case because Facebook users who watch media outlets anticipate posts that are both high quality and pertinent, not just frequent. In fact, when analyzing the graph, it is seen that the number of postings is essentially the same from the first year when compared to the last year, but the engagement rate has decreased by nearly a full point. This demonstrates that the sector's

new strategy is not successful at all. Even when there are more postings, participation scarcely changes. This can be seen in graph 44.

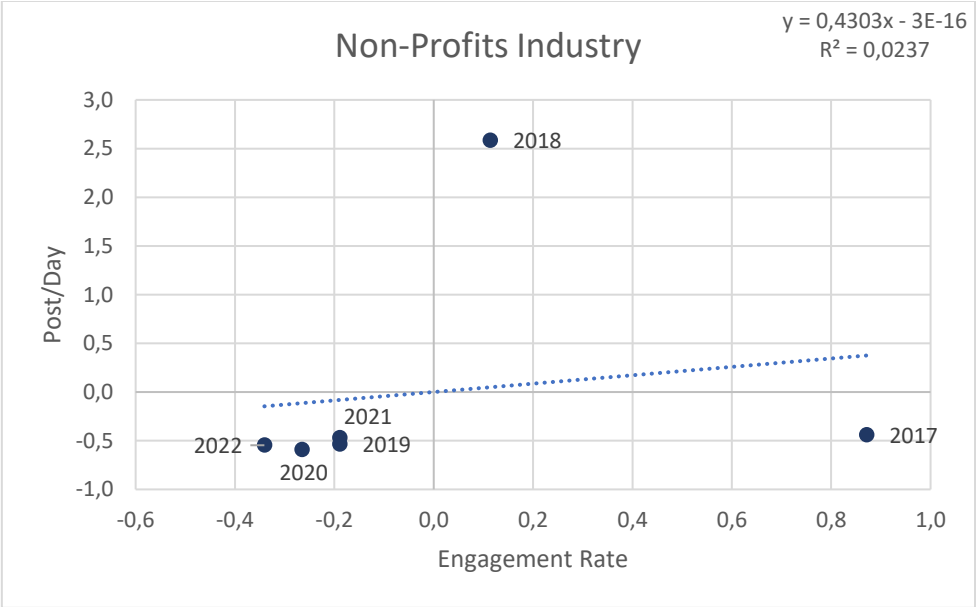
Graph 44. Media industry Facebook correlation.



Source: Own Elaboration

Non-Profit sector on Facebook has a R^2 value of 0.0237, which indicates that there is very little relationship between the two metrics in this sector. When looking at the graph, it is clear that this industry has a very reliable pattern for posting frequency over time. Over the years, the amount of posting has been more or less the same with negative values but pretty close to 0. It is odd, though, that the engagement loses more than one whole point at the end of the studied period. This can be seen in graph 45.

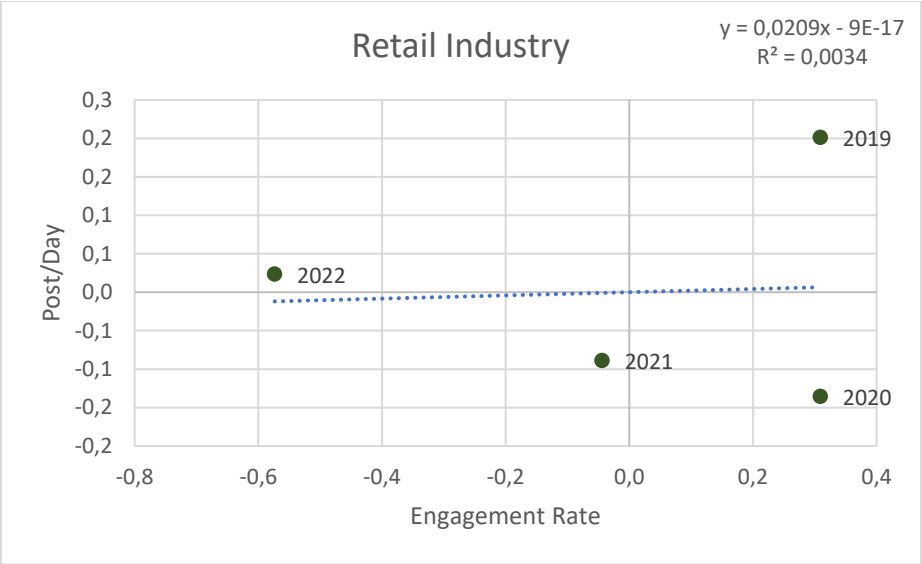
Graph 45. Non-Profits industry Facebook correlation.



Source: Own Elaboration

In the Retail sector, it is common to see inconsistent behavior that, at first glance, defies historical trends. The R^2 value with a linear trend line is really 0.0034, taking a value extremely close to 0. It is clear that there is no link between the variables or influence that they exert on one another. This suggests that the number of daily postings and the change in the engagement rate are separate factors that do not impact one another. A closer look at the graph reveals that there is a 2.5-point decrease in the number of posts from 2019 to 2020 although the degree of engagement generated is good and has relatively comparable values in both years. This pattern reverses for the years 2021 and 2022, where it is evident that there is no association between the variables. This can be seen in graph 46.

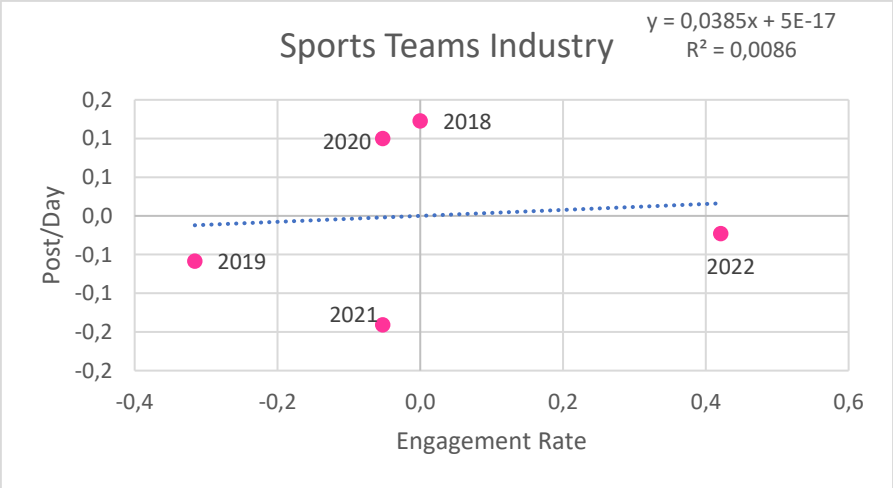
Graph 46. Retail industry Facebook correlation.



Source: Own Elaboration

The Sports Teams industry similarly has a poor correlation between the variables, with a extremely low correlation value of 0,0086. In this particular instance, it is shown that the rise in interaction has been positive while keeping the same daily posting rate (*Graph 47*).

Graph 47. Sports Teams industry Facebook correlation.

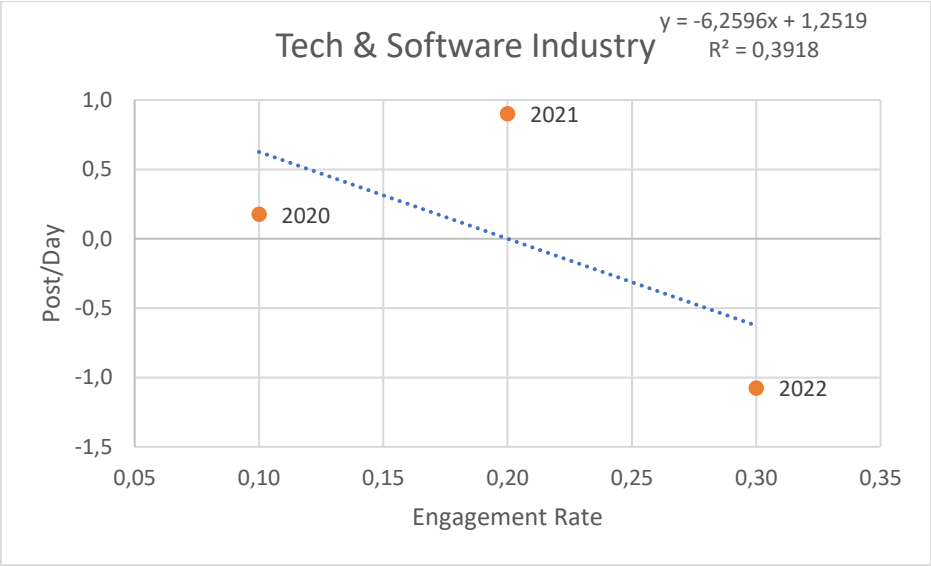


Source: Own Elaboration

Finally, we examine the Tech & Software sector has a R^2 value of 0.39, which indicates a modest connection between the two factors. In other words, Facebook interaction rates can slightly increase when posts are made more frequently. This is seen in the years 2020

and 2021. However, in 2022, the engagement value is at its highest, but the frequency of post is at its lowest which is intriguing. This can be seen in graph 48.

Graph 48. Tech & Software industry Facebook correlation.



Source: Own Elaboration

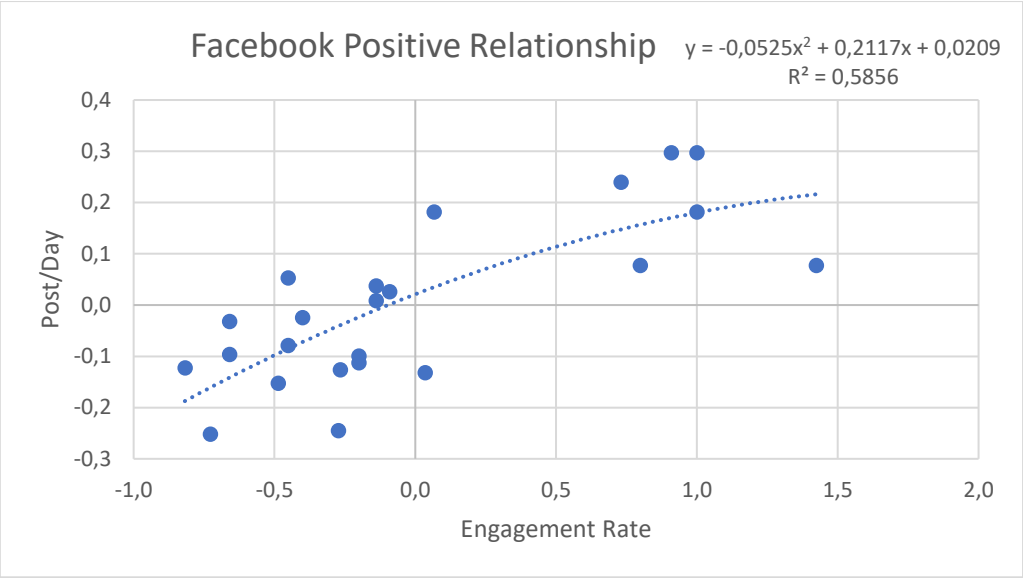
After analyzing the fourteen Facebook verticals, we have learned that we can create too three subsets of dataset depending on whether the relationship among the variables is positive, negative, or neutral (non-existent).

Taking all this into account, within the first group, with a positive and strong relationship between variables, we find the Fashion, Food & Beverages, Higher Education and Home Decoration industries. This can be seen in graph 49. In this case it is also observed that the joint relationship remains positive between the variables with a high R^2 value and that therefore, the industry association is well done.

There are some parallels and traits that the sectors have in common, such as a strong social media presence and the significance of incorporating the lifestyle and personalization to ensure a positive customer experience. These sectors are very busy on social media and make good use of the platforms to interact with their fans and clients and advertise their goods and services. Businesses in these sectors aim to provide customized goods and services that are catered to the unique requirements of their clients. To ensure consumer happiness, these sectors must take into consideration how people

dress, what they eat and drink, what kind of education they receive, and how they adorn their houses as these factors all determine their lives.

Graph 49. Facebook Top Players.



Source: Own Elaboration

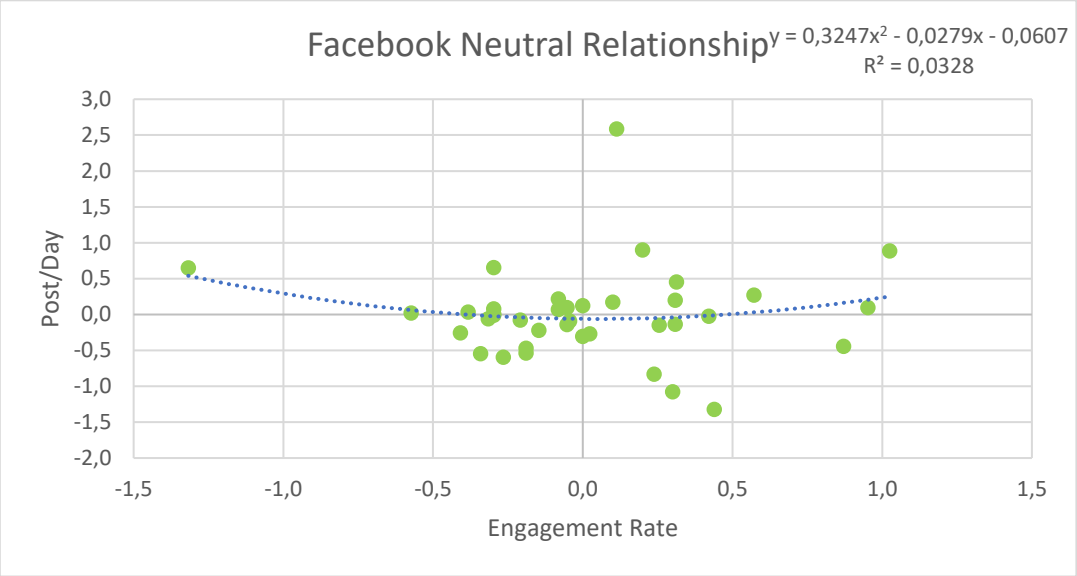
In the second group, with a strong negative relationship, we only find the Financial Services industry. In this case, we will not include a graph as this was previously done when analyzing the industry on its own.

Finally, in the group where there is no relationship, we find the Alcohol, Hotels & Resorts, Influencers, Media, Non-Profits, Retail, Sports Teams, and Tech & Software industries. This can be seen in graph 50. In this case, it is also clear that the result from joining companies whose variables do not show any relationship is the same that the analysis of each industry separately. In other words, the new graph continues to show that the influence and relationship between engagement and post frequency is barely existent and therefore, the behavior of a variable must be defined by other variables not included in this analysis.

Although these sectors may appear to be very dissimilar to one another, there are some points of overlap and cooperation between them. These sectors may be connected through advertising and marketing tactics. For online product promotion, influencers may be employed by booze companies, lodging establishments, or retail stores. In many of these

sectors, media advertising—whether on television, radio, or digital media—is also prevalent. Additionally, hotels, resorts, and sports organizations frequently collaborate by sponsoring local, regional, and worldwide sporting activities.

Graph 50. Facebook Random Players.



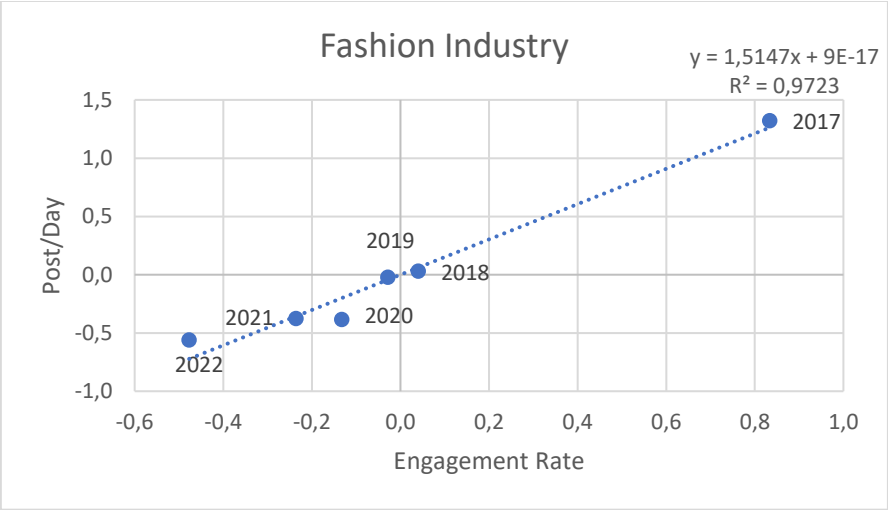
Source: Own Elaboration

4.2.3 TWITTER STUDY

The research will now be conducted on Twitter in the same manner as it was on Instagram and Facebook.

The Fashion business has a positive value correlation of 0.9723. The significant coefficient value denotes a nearly perfect correlation between the variables, and the direction is also positive, which implies that when one increases the other one does too. However, it is seen that the year of 2017 could be consider as on outlier itself as it displays considerably extremely high values for both variables compared to the following years. This can be seen in graph 51.

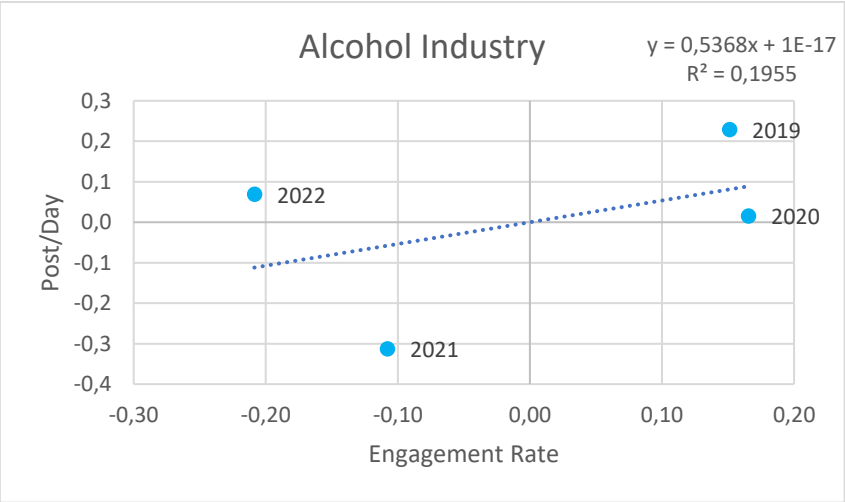
Graph 51. Fashion industry Twitter correlation.



Source: Own Elaboration

The Alcohol industry's has a R^2 value of 0.19, which indicates that there is only a weak relationship between the two metrics in this sector. Uploading too much promotional and commercial content might not be well received and might result in fewer responses from followers. Content that encourages accountability, enjoyment, and the user experience may get a better reaction from fans. When analyzing the graph, one can see that the observations collected show a random component that follows no pattern. In fact, the number of postings in 2020 and 2022 is essentially the same, but the industry's engagement rate is nearly cut in half. This can be seen in graph 52.

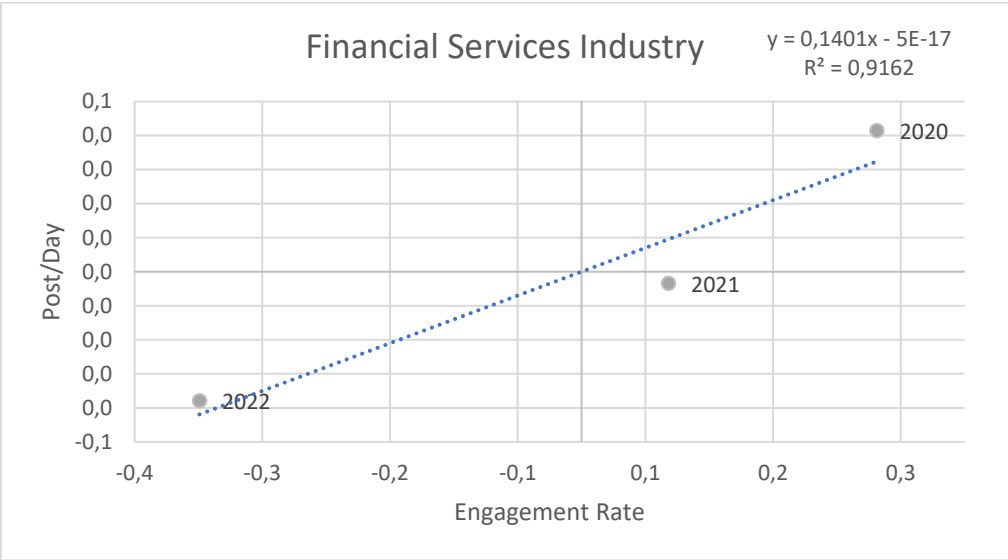
Graph 52. Alcohol industry Twitter correlation.



Source: Own Elaboration

The Financial Services sector has a value of R^2 of 0,9162. The finding implies a positive correlation between the variables, meaning that when one increases, the other should also increase and vice versa. However, the evolutionary tendency is unfavorable, as we have observed in other businesses. This can be seen in the first year of the study, both variables displayed positive values and in the last years, this is inverse, with negative values in both cases, showing that the sector is posting less and that this is resulting in fewer engagement. This can be seen in graph 53.

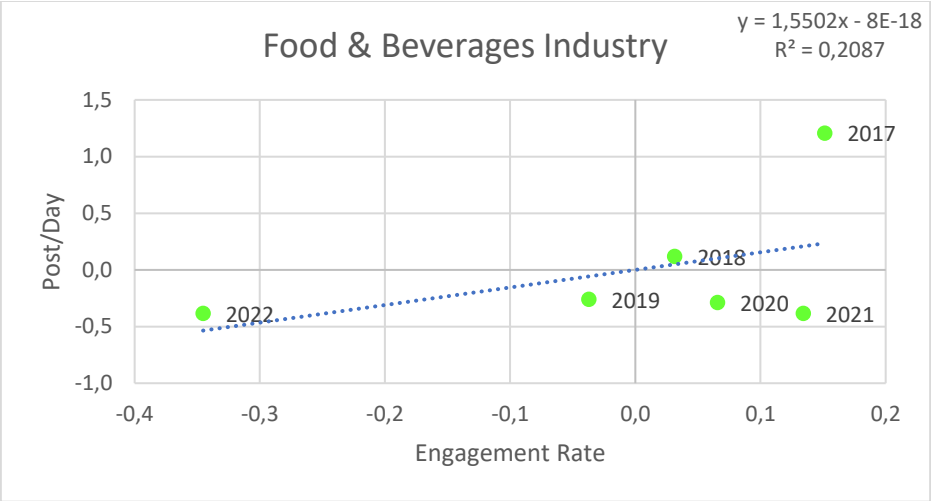
Graph 53. Financial Services industry Twitter correlation.



Source: Own Elaboration

Food & Beverages sector proves a correlation of 0.2087. During the first five years, it can be seen that the degree of involvement is very consistent, remaining between 0.2 and 0. Also, in those years the number of postings each day stays around the same values which backs up this stability. However, in 2022, an entirely different pattern of behavior is seen, with the engagement rate drastically declining and the frequency of posts remaining roughly the same as in prior years. This can be seen in graph 54.

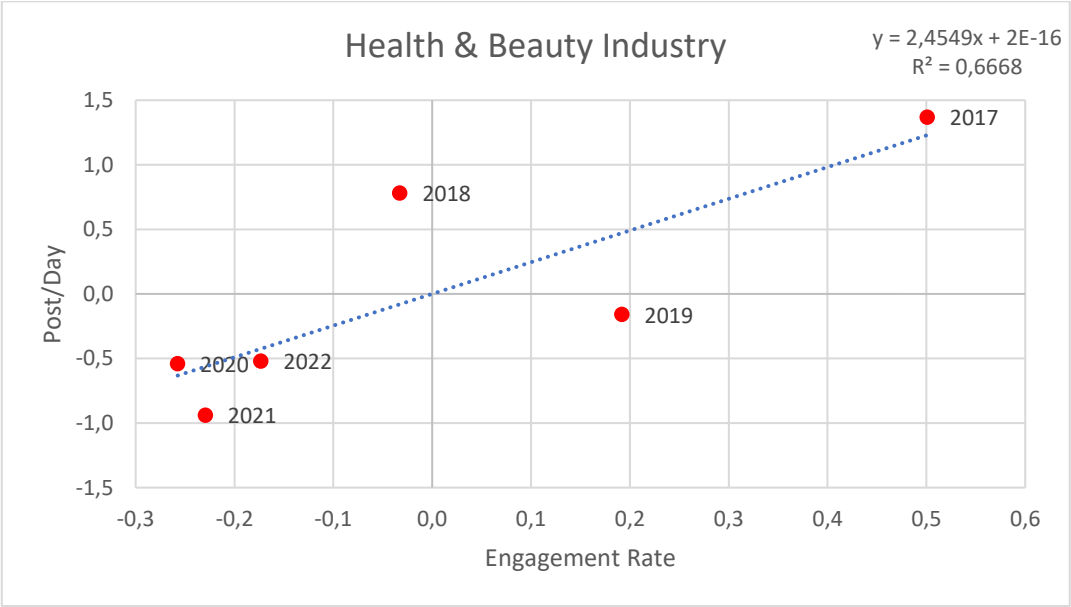
Graph 54. Food & Beverages industry Twitter correlation.



Source: Own Elaboration

The Health & Beauty sector shows a coefficient of 0.6668. This suggests that the variables are positively related to one another. A deeper inspection of the graph reveals that the industry's high degree of correlation from 2017 has not been repeated. In the last three years, however, a very distinct pattern of behavior has emerged in which the frequency of daily posts is pretty low, and the engagement rate created is also poor (*Graph 55).*

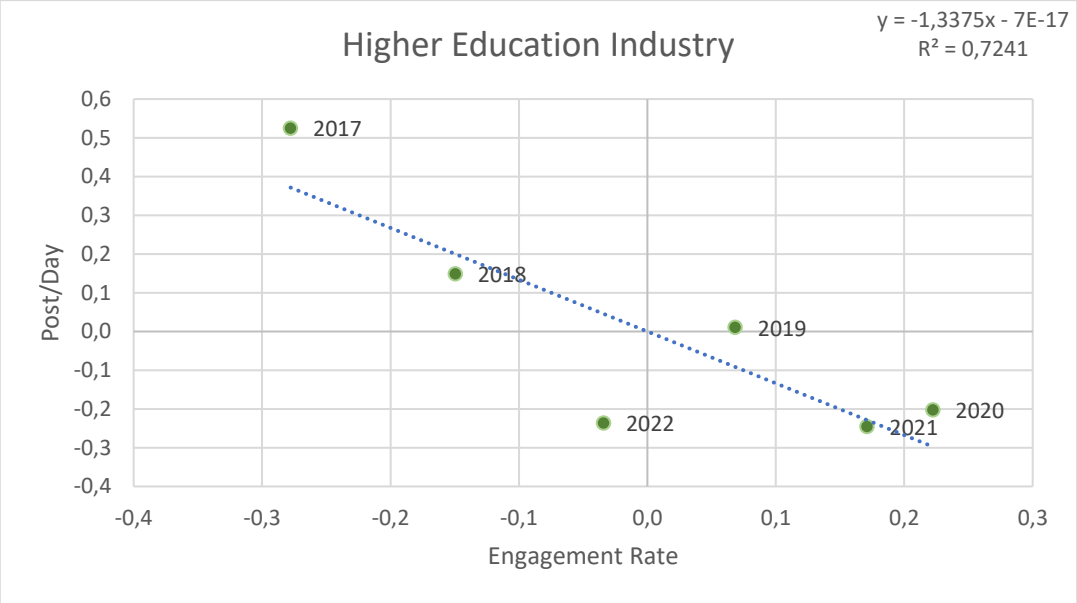
Graph 55. Health & Beauty industry Twitter correlation.



Source: Own Elaboration

Higher Education Industry has a R^2 of 0.7241. This demonstrates a substantial correlation between the variables, but it is also clear that the association has a negative direction. This means that when one variable rises, the other falls. In the early years, both the engagement rate and post frequency were quite high. In the years that follow, it is found that as the number of postings declines, user engagement and involvement rise (*Graph 56*).

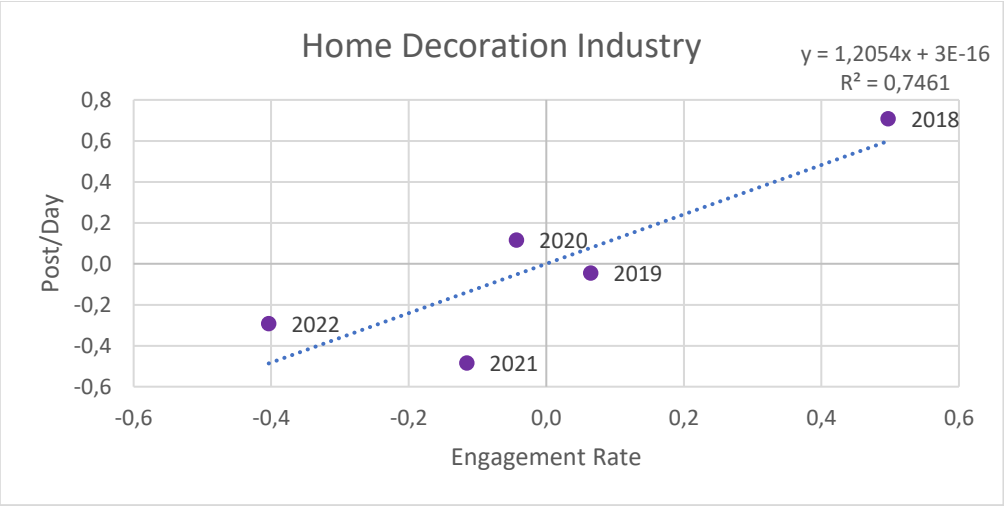
Graph 56. Higher Education industry Twitter correlation.



Source: Own Elaboration

The correlation for the Home Decoration business is quite good, with a value of 0.7461 and a positive direction. It can be seen that during the early years, both the industry-wide level of involvement and the daily posting frequency are at their greatest. Over time, this pattern does, however, shift. Frequency and involvement have decreased during the last years, with the lowest values for the sector in both variables (*Graph 57*).

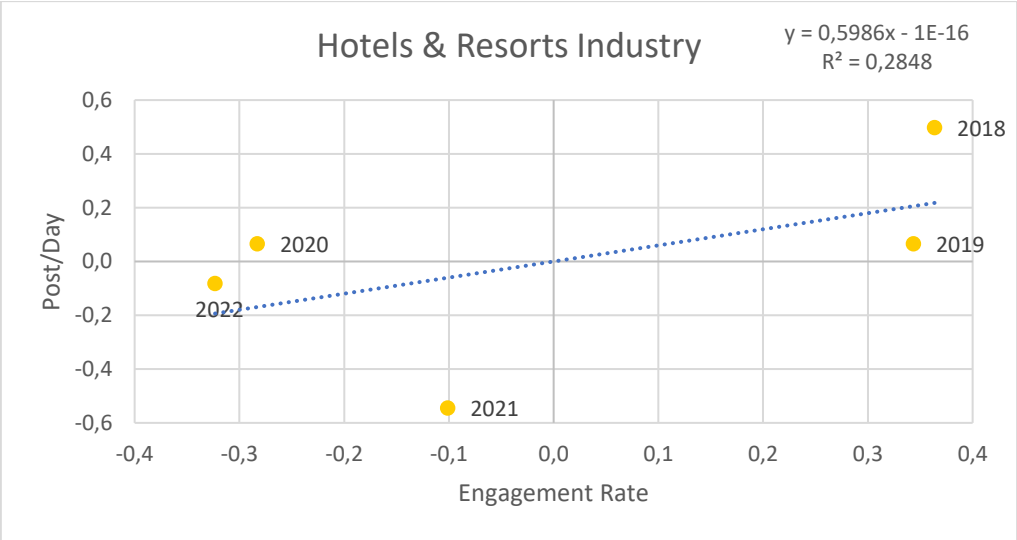
Graph 57. Home Decoration industry Twitter correlation.



Source: Own Elaboration

The R^2 value for the Hotels & Resorts industry is 0.2848, suggesting that there is not a strong association and effect between the variables. The industry's highest involvement was seen in 2018 and 2019. However, compared to 2018, the number of postings per day is about 4 times fewer in 2019. Engagement is quite low for 2020 and 2022, and posting frequency is comparable to that of 2019. Something else must have changed in the industry that is impacting its degree of engagement beyond the variable of posting frequency. This can be seen in graph 58.

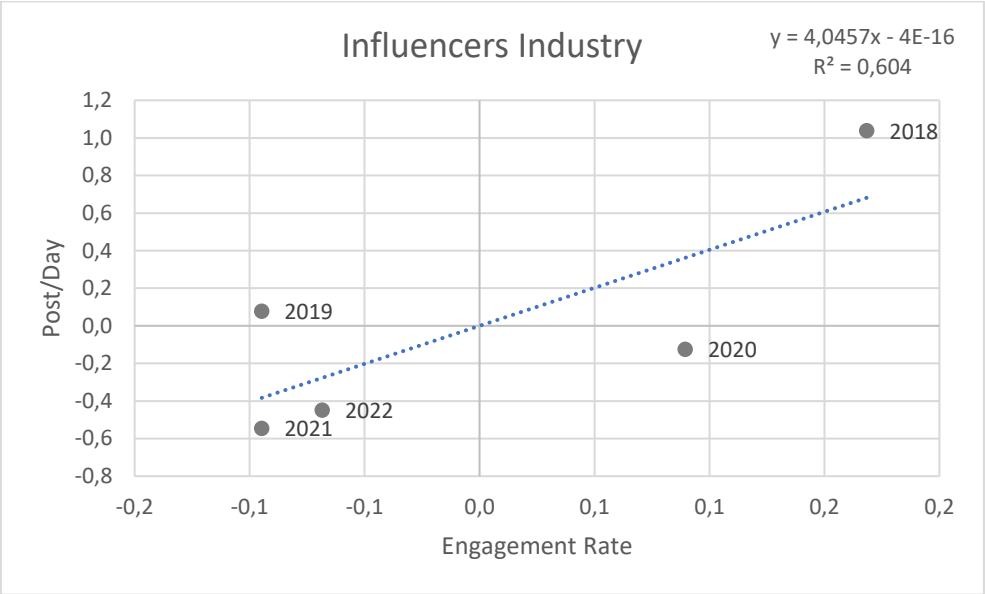
Graph 58. Hotels & Resorts industry Twitter correlation.



Source: Own Elaboration

A R^2 value of 0.604 is for the Influencers sector. This demonstrates a positive interaction between the two variables and how one influences the other's growth. The industry's evolution, nevertheless, is unfavorable. With the largest frequency of posts displaying positive values in 2018, engagement is at its maximum. In contrast, for the following years, the frequency is substantially lower, indicating negative values that are near to zero. The engagement that was generated also displays negative numbers (Graph 59).

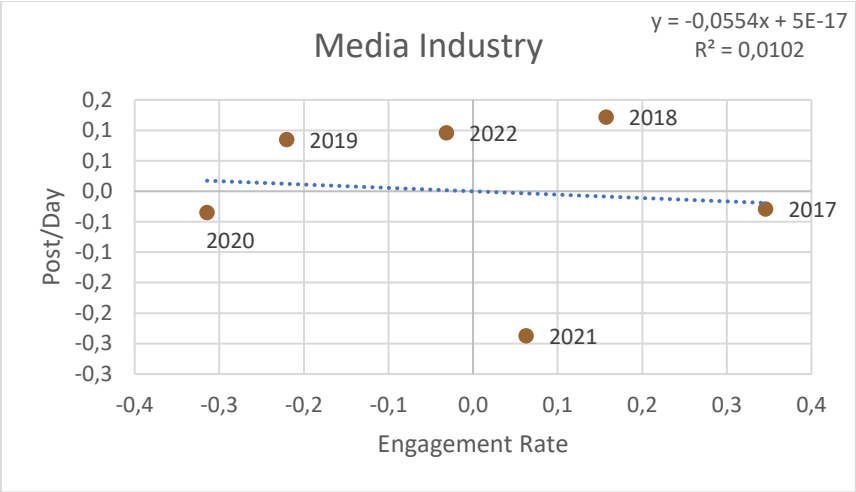
Graph 59. Influencers industry Twitter correlation.



Source: Own Elaboration

The analysis of the Media reveals a R^2 value of 0,0102. This implies that there is no relationship between the evolution of one variable and the other, and as a result, it is possible to say that there is no influence between them. When looking at the graph, it is clear that the observations vary from year to year and that there is no particular pattern to follow. This supports the claim that how this industry functions to generate interaction or how frequently a piece is published depends on external factors that have not been considered. This can be seen in graph 60.

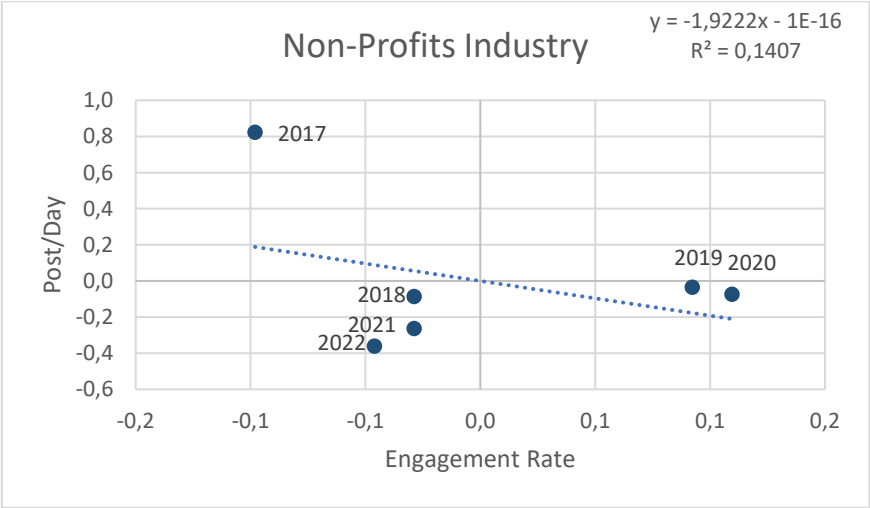
Graph 60. Media industry Twitter correlation.



Source: Own Elaboration

The R^2 for the Non-Profits industry is 0.147. This demonstrates that there is not a strong correlation between the two variables and that there is not a consistent pattern from which to infer definitive statements about how these variables interact. The year 2017 has a relatively high post frequency, but the interaction rate is poor. For the following years, this post frequency considerably decreases. It is a sector that generally does not publish frequently. The engagement rate is at its maximum between 2019 and 2020. Observing the values, enables us to state unequivocally that neither frequency nor interaction are valued highly in this sector of the market. This can be seen in graph 61.

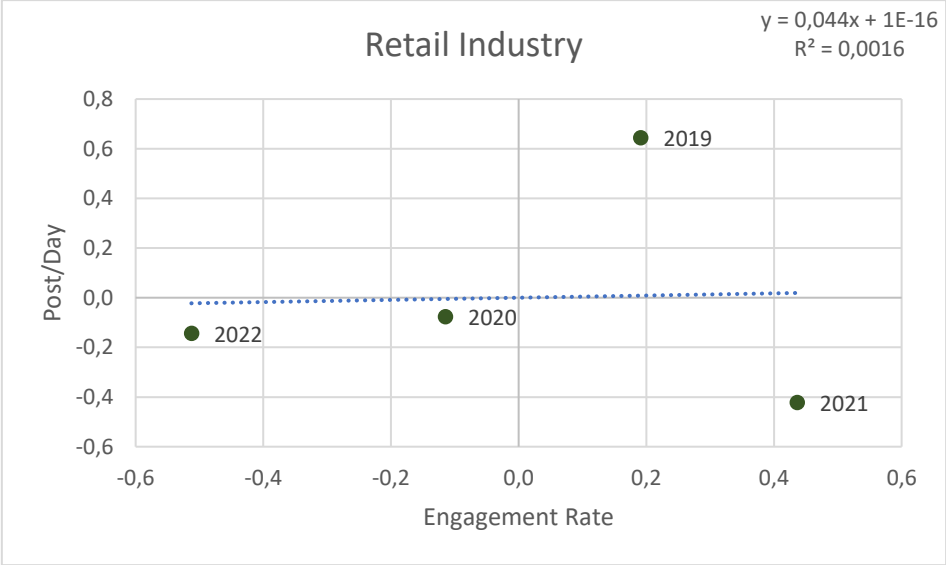
Graph 61. Non-Profits industry Twitter correlation.



Source: Own Elaboration

The low R^2 value of 0,0016 in the Retail industry further support the lack of significant effect of one variable on the other. The graph's analysis reveals that the behavior of the interactions between the variables varies from year to year, making it impossible to draw any firm conclusions that may guide the industry in choosing how frequently to publish in order to increase engagement. This can be seen in graph 62.

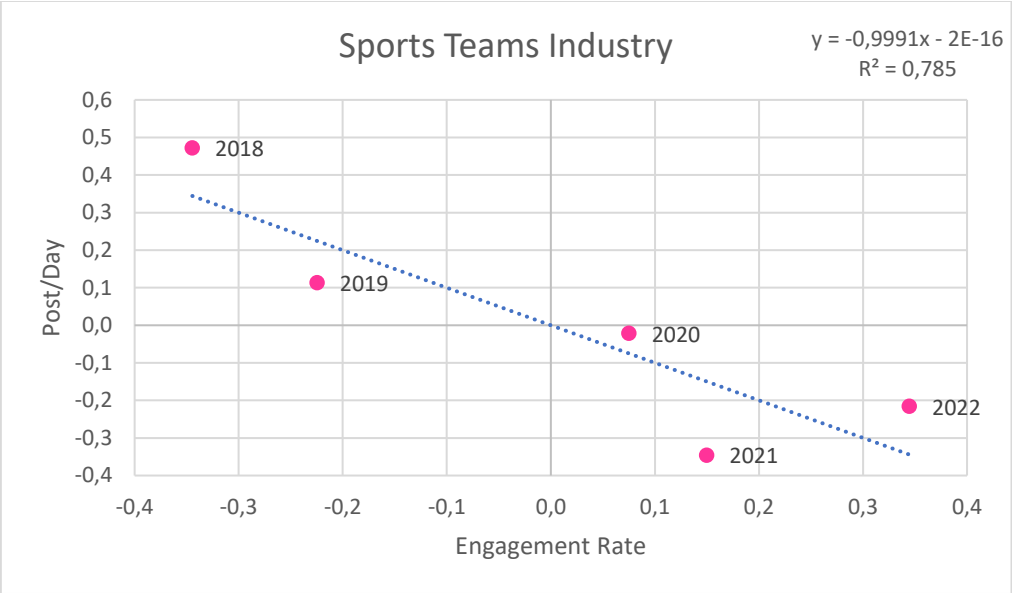
Graph 62. Retail industry Twitter correlation.



Source: Own Elaboration

Sports Teams industry exhibits a R^2 of 0.785. This shows a strong connection between the variables with a negative direction. In other words, it can be seen that as one variable increases, the other decreases. The engagement rate and post frequency were both pretty high in the beginning. In the years that follow, it is discovered that user engagement and involvement increase as the quantity of postings decreases. In this industry we can see that sometimes less is better. This can be seen in graph 63.

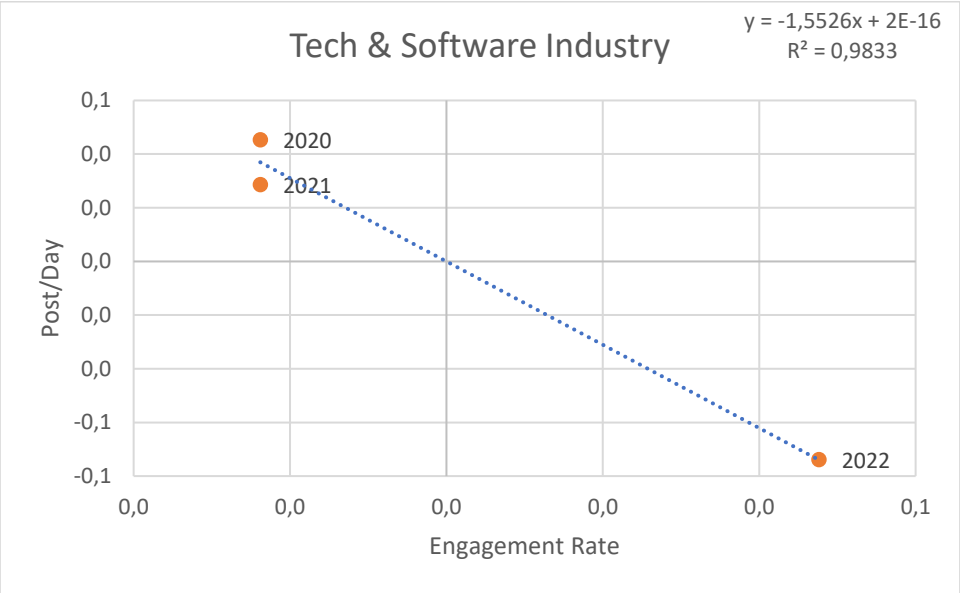
Graph 63. Sports Teams industry Twitter correlation.



Source: Own Elaboration

The Tech & Software sector has almost a perfect correlation of 1 showing a R^2 of 0,9833 and a positive direction. However, as we have seen in other industries, the evolutionary trend is not good. When comparing the first and last years, it is clear that both the interaction and the quantity of daily postings have considerably fallen (*Graph 64*).

Graph 64. Tech & Software industry Twitter correlation.

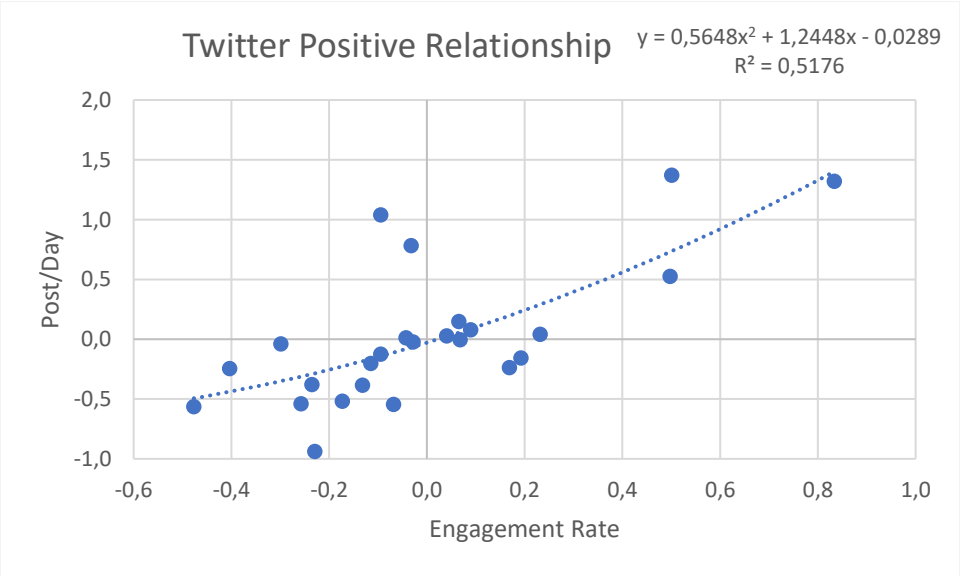


Source: Own Elaboration

We can make three subsets of the dataset based on whether the connection between the variables is positive, negative, or neutral (non-existent) after examining the fourteen Twitter verticals.

Taking all this into account, within the first group, with a positive and strong relationship between variables, we find the Fashion, Financial Services, Health & Beauty, Home Decoration, and Influencers industries. This can be seen in graph 65. Again, the R^2value and trend are shaped similarly to the various sectors when studied separately. This implies that industries are following a positive trend and that the more posts they publish, the more engagement they will generate among their followers. It is true that most industries have characteristics in common as they are focused on the physical and superficial part, on what others see. The Financial services sector is a bit more different from the rest, but for instance it is a bit more focused on the physical and superficial part, on what others see can support the marketing and funding of events and goods, as well as promote consuming and discretionary spending in the fashion, beauty, and home décor sectors. Additionally, financial services companies' gathering, and analysis of market data and patterns can assist businesses in the fashion, cosmetics, and home décor industries in creating more successful strategies to satisfy their customers' wants and needs.

Graph 65. Twitter Top Players.

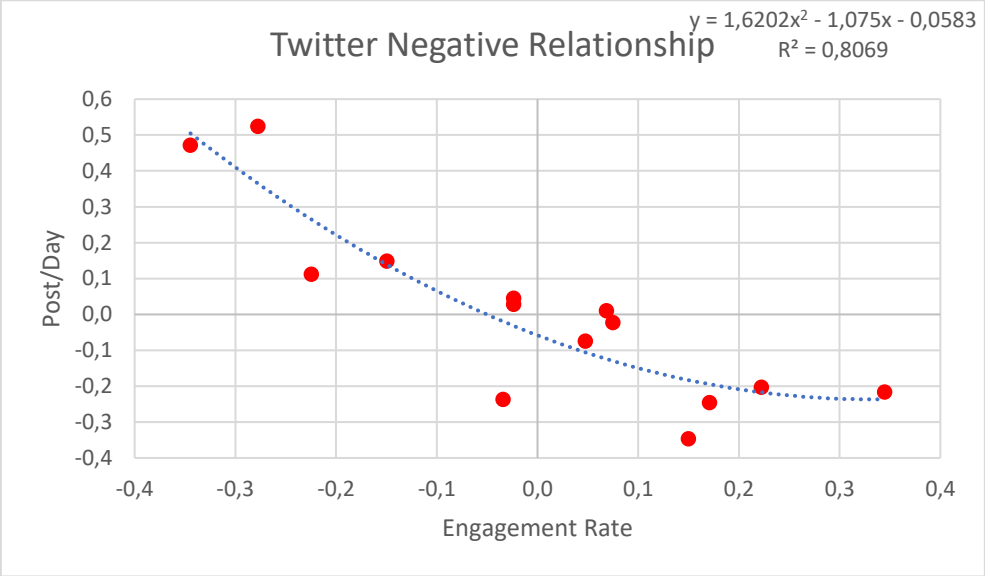


Source: Own Elaboration

In the second group, with a strong negative relationship, we find the Higher Education, Sports Teams, and Tech & Software industry. This can be seen in graph 66. Again, the R^2 value and trend are shaped similarly to the various sectors when studied separately, showing that when one variable rises, the other decreases.

These three sectors are similar in that they have a close relationship with invention and technology. Modern technologies are used in higher education to convey information, and in sports organizations to enhance athlete success and conduct data analysis. The creation of new innovations is fueled by the technology and software sectors. The sectors also emphasize customer experience. These sectors concentrate on giving consumers and clients unique experiences. The teaching experience is prioritized in higher education, whereas the fan experience is prioritized by sports organizations. The goal of the technology and software sectors is to make their goods and services as smooth and user-friendly as possible.

Graph 66. Twitter Worst Players.



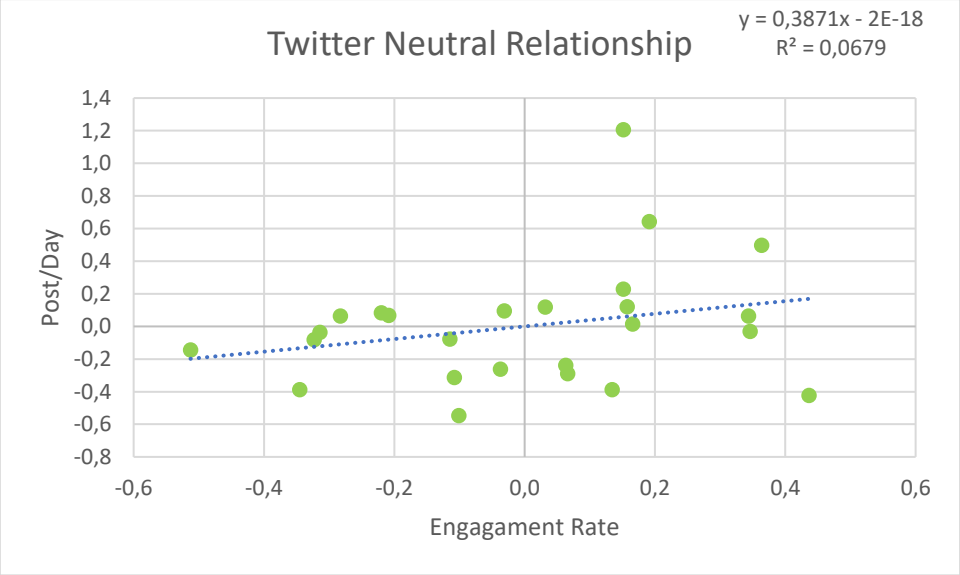
Source: Own Elaboration

Finally, in the group where there is no relationship, we find the Alcohol, Food & Beverages, Hotels & Resorts, Media, and Retail industries. This can be seen in graph 67. In this instance, it is also obvious that the outcome of combining businesses whose variables do not indicate a relationship is identical to the outcome of analyzing each sector individually. In other words, the new image still demonstrates how little impact and

connection there is between interaction and post frequency. As a result, other factors outside the scope of this study must describe a variable's behavior.

There are several similarities between the sectors. Offering exceptional customer experiences is the main emphasis of all of them. These sectors, which range from hospitality with welcoming surroundings and helpful employees to retail with a large variety of goods and excellent customer service, all aim to make the customer feel unique and valued. The timing of these sectors has a significant impact as well. These sectors frequently experience cycles of high and low demand and sales. For instance, the summer is a busy time for the hospitality and vacation sectors, while the holidays are a time when sales of alcoholic beverages tend to rise.

Graph 67. Twitter Random Players.



Source: Own Elaboration

5. CONCLUSIONS

Interesting conclusions may be derived after carefully examining the engagement rate and the daily post frequency produced of a total of 14 industries on the three most significant social networks, Instagram, Facebook, and Twitter.

First off, it can be said that there is a difference between those industries with a high social media engagement rate and others with a significantly lower value. Different sectors might have different social media engagement rates for a variety of reasons. The amount of social media interaction that a particular industry experiences is largely determined by a number of variables, including platform utilization, audience relevancy, content quality, and demography. A few examples of industries displaying high values of engagement rate are Higher Education, Non-Profits, Influencer and Sports Teams as opposed to Home Decoration, Food & Beverages, Health & Beauty, and Tech & Software that have lower engagement rates.

Engagement rates are often greater in sectors that the general public finds more relevant and attractive. For instance, because these subjects have a broad appeal, the Influencer, Higher Education, Sports Teams, and Fashion industries frequently have greater interaction rates. Indeed, influencer marketing, according to Tafesse & Wood (2021), is a tactic, organizations employ to interact with customers. As a consequence, social media users tend to identify more with influencers than with conventional celebrities, which causes the engagement rate in this industry to be greater as well. Sports firms use social media to interact with clients in a lighthearted and enjoyable way, usually adopting a more humanistic and individualized approach (Filo et al., 2015). Eagleman (2013), discovered that social media is a strategic communication tool used to foster the brand's relationship with fans and promote the sport, not a marketing tool to activate sponsorship and send promos. The findings illustrate the role of social media in establishing connections between businesses and customers and demonstrate how social media research in sport management is consistent with the logic of service domination. It takes connection and engagement to build these relationships (Filo et al., 2015). The research of the Fashion industry, however, yields an unusual finding because it does not exhibit high involvement levels. According to Bashar et al. (2012), internet marketing methods are essential for all sorts of organizations, but they are crucial in sectors like fashion that are continually

impacted by trends. Although fashion exhibits a high posting frequency in this database study, engagement rates are not as great as they are in other industries.

On certain social media networks, particular industries could be more active than others. For instance, the influencers sector has a significant presence on Instagram, but the financial services sector is well-represented on Twitter. As was previously noted, there are few businesses that can maintain a strong presence on many platforms at once, and higher education is one of them.

The sort of information that may be posted on social media is also restricted in other sectors, including banking, healthcare, and the food and beverages industry. This has an effect on the level of participation that is created. In fact, as Stutzman & Hartzog (2012), stated in the research he conducted, the healthcare industry is subjected to regulations regarding patient privacy, the banking industry is subject to regulations such as the Financial Industry Regulatory Authority (FINRA), which restricts the type of information that can be shared on social media, particularly regarding advertising and marketing, and alcohol products are generally heavily regulated in many countries.

On the other side, certain industries have a low percentage of engagement. In this instance, it would be simple to conclude that the failure to do the aforementioned activities appropriately is to blame.

As we move on to the second major finding of the investigation, we concentrate on the fact that certain industries are far more active on social media than others, posting significantly more often. The industry, target market, and marketing objectives, among other things mentioned by Kawasaki & Fitzpatrick (2014), will all have an impact on how frequently postings are made on social media.

Kawasaki & Fitzpatrick (2014), argue that Fashion and Retail, two industries with aesthetically appealing items, may post on social media more regularly because they have more opportunity to contribute engaging material. For instance, Bashar et al. (2012) states that in order to engage their audience and develop their brand, a fashion business may publish photographs of models enjoying their newest creations or offer behind-the-scenes shots from a photo session. Additionally, because fast fashion is the newest trend,

businesses must be able to guarantee that the latest goods are visible to pique consumer interest and prompt a purchase.

Last but not least, high levels of rivalry require certain industries to publish more regularly in order to keep in front of their target audience and the competitors. An excellent illustration of this is the fast-food sector. To encourage clients to visit their restaurants, businesses in this sector routinely post on social media about their new menu items, special offers, and food photographs.

On the other side, there are a few reasons why businesses could post less frequently on social media according to Gleason. But, as was already said, certain sectors have rules and limitations that restrict the information that may be posted on social media, which may deter businesses from posting regularly. Regarding this factor as well, Gleason affirms that healthcare businesses are subject to strict regulation. The European Medicines Agency (EMA) has strong laws and regulations surrounding the advertising of prescription pharmaceuticals on social media, and businesses must adhere to them. Businesses must make sure that the information they post on social media is accurate, not deceptive, and conforms with the law. Since the businesses must thoroughly analyze and approve any social media content before it is published, this leads to fewer and less interesting posts. Additionally, some firms, especially small businesses, do not have the resources to dedicate to social media, making it more difficult to post often.

The third finding that can be drawn from this study has to do with the correlation that the engagement level and the frequency of daily posts variables show amongst themselves and how one affects the other. The correlation between the frequency of daily posts on social media and the engagement rate is not a straightforward relationship. Depending on a number of variables, including the platform, audience, and content, there may be a positive or negative association between engagement and the frequency of postings on social media.

When a company updates frequently, but not too frequently, in order to maintain the attention and engagement of its audience, there may be a positive link between engagement and frequency of postings. On the other side, when a company posts too frequently, it can cause saturation and a decline in engagement, which has a negative correlation between engagement and frequency of postings. This could happen as a result

of people becoming overloaded with material, which makes it hard for them to keep up with, or because they just start ignoring it. Too few posts may also lead to reduced engagement since people may stop paying attention to a business or account if they do not see consistent activity.

Businesses may increase engagement via frequent posting by taking several actions. First figuring out, through performance analysis and audience research, the ideal posting frequency for their targeted audience. It is obvious that there are patterns in some sectors as seen while conducting the specific industry study. For instance, some industries posted a lot in the early years of the research and then changed their approach and drastically cut back on posts. This shows that businesses do try to determine the ideal posting frequency and gauge customer response before deciding on the best course of action.

Second, maintaining followers' interest requires consistency. To achieve exposure and keep a presence on the platform, businesses should publish often at regular intervals. According to certain statistics, when it comes to the frequency of postings and the degree of involvement elicited, less might sometimes be more. Every industry should choose the quantity and timing of its social media posts considering this.

As we have seen throughout the analysis, there are certain industries that have a positive relationship between the engagement rate they generate in their users and the frequency with which they publish a post. This is related to the social media marketing strategy, which seeks to increase the engagement rate in order to improve the interaction and relationship with the followers of a brand or product.

It is true that at the beginning, when you have a positive relationship with your followers, it is easier to achieve a high engagement rate. This is because followers feel more engaged with the brand or product, which leads them to interact more with the posts that are published.

To increase exposure and interaction, businesses should concentrate on the periods when their target audience is most engaged on the site. Industries that are heavily impacted by time trends should pay close attention in this situation. For instance, the fashion business used to publish frequently since it must keep its customers informed of what is new since the industry is known for its quick pace. However, in sectors like sports teams that might

be more impacted by certain tournaments, the industry needs to be accurate regarding the frequency of posting before, during, and after the event in order to keep users interested.

Additionally, we have observed that in some sectors, there is an inverse correlation between the number of posts and the engagement rate, with fewer posts being associated with higher engagement rates. The goods provided in these sectors are more suited to irregular consumption, and as a result, the information is condensed in a few articles that get more attention. This is the case in this instance.

Additionally, it is stated that these sectors have a smaller selection of goods, which makes impulsive buying less common. Because there is a finite quantity of engagement, the engagement per post increases as the number of posts decreases.

This context suggests that it is preferable to create a single post with all the material for these sectors. This is due to the fact that the selection of goods is more limited, and less material needs to be produced to maintain followers' interest.

Finally, businesses keep an eye on their interaction levels and modify the frequency and content of their posts as necessary. A sector may need to raise or alter the frequency or topic of its postings if it notices that engagement levels are declining. The industry-specific data also reveals that some industries suffer changes in posting frequency. Sometimes these changes result in increased engagement levels, whereas other occasions they have a detrimental impact on this measure. Because of this, it is crucial to comprehend how each industry's degree of participation functions.

As a general conclusion of the whole study, we can state that there are two key elements that affect the effectiveness of a social media campaign which are the engagement level and the frequency of posting on social media. The findings of this study suggest a correlation between social media engagement levels and posting frequency that is favorable, unfavorable or neutral, depending on the industry and the platform. It was also discovered that a high posting frequency can improve engagement, but only to a certain degree. Beyond that, increased posting frequency may result in lower engagement. In order to avoid overwhelming the audience and maintain a continuous presence, it is crucial for marketers and social media managers to carefully analyze the frequency of their updates.

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7. APPENDIX

This appendix shows part of the code developed in R for data processing and obtaining correlations. It is only shown for a single platform (Instagram), a single year (2022) and one of the industries studied (Fashion).

```
library(readxl)
X2017_informe <- read_excel("2017 informe.xlsx",
                            sheet = "Analisis datos ")
View(X2017_informe)
datos <- X2017_informe #changing the file name: easier to work with
#we are selecting the sheet with all the variables together
#the data frame has 70 observations of 35 variables
###--------------STANDARDISATION OF DATA--------------
#to standardise the data we use scale function
datos1 <- datos
datos1$`INSTAGRAM ENGAGEMENT` <- (datos1$`INSTAGRAM ENGAGEMENT` - mean(datos1$`INSTAGRAM ENGAGEMENT`))/sd(datos1$`INSTAGRAM ENGAGEMENT`)
datos1$`INSTAGRAM POSTS PER DAY` <- (datos1$`INSTAGRAM POSTS PER DAY` - mean(datos1$`INSTAGRAM POSTS PER DAY`))/sd(datos1$`INSTAGRAM POSTS PER DAY`)
View(datos1)
#library(readr)
#write_csv(datos1, "C:/Users/mmaip/OneDrive - Universidad Pontificia Comillas/TFG MKT DIGITAL/Datos informes/datos_estandarizados.csv")
#para descargarnos los datos estandarizados a un excel y hacer cosas con excel tb
###--------------STANDARDISATION OF INSTAGRAM DATA WITHOUT OUTLIERS--------------
datos_insta <- datos
which(datos_insta$INDUSTRIES == "Higher Education")
#4,10,21,34,48,62
which(datos_insta$INDUSTRIES == "Sports Teams")
#16,28,41,55,69
datos_insta <- datos[-c(4,10,21,34,48,62,16,28,41,55,69),]
datos_insta$`INSTAGRAM ENGAGEMENT` <- (datos_insta$`INSTAGRAM ENGAGEMENT` - mean(datos_insta$`INSTAGRAM ENGAGEMENT`))/sd(datos_insta$`INSTAGRAM ENGAGEMENT`)
datos_insta$`INSTAGRAM POSTS PER DAY` <- (datos_insta$`INSTAGRAM POSTS PER DAY` - mean(datos_insta$`INSTAGRAM POSTS PER DAY`))/sd(datos_insta$`INSTAGRAM POSTS PER DAY`)
#library(readr)
#write_csv(datos1, "C:/Users/mmaip/OneDrive - Universidad Pontificia Comillas/TFG MKT DIGITAL/Datos informes/instagram_outliers.csv")
#para descargarnos los datos estandarizados a un excel y hacer cosas con excel tb
###--------------REMOVING OUTLIERS--------------
#to find outliers, we use the z score method as we standardized the data the same way
#outliers = observations > 3
```

```
#outliers = observations < -3
#instagram engagement
summary(datos1$`INSTAGRAM ENGAGEMENT`)
outliers1 <- datos1$`INSTAGRAM ENGAGEMENT`[which(datos1$`INSTAGRAM ENGAGEMENT` >3 | datos1$`INSTAGRAM ENGAGEMENT` < -3 )]
no_outliers1 <- datos1$`INSTAGRAM ENGAGEMENT`[which(datos1$`INSTAGRAM ENGAGEMENT` <3 & datos1$`INSTAGRAM ENGAGEMENT` >-3 )]
boxplot(datos1$`INSTAGRAM ENGAGEMENT`)
#instagram posts per day
summary(datos1$`INSTAGRAM POSTS PER DAY`)
outliers2 <- datos1$`INSTAGRAM POSTS PER DAY`[which(datos1$`INSTAGRAM POSTS PER DAY` >3 | datos1$`INSTAGRAM POSTS PER DAY` < -3 )]
no_outliers2 <- datos1$`INSTAGRAM POSTS PER DAY`[which(datos1$`INSTAGRAM POSTS PER DAY` <3 & datos1$`INSTAGRAM POSTS PER DAY` >-3 )]
boxplot(datos1$`INSTAGRAM POSTS PER DAY`)
#standardisation and outliers is done

###next step: study of correlation between engagement rate and frequency of post among all industries and different channel
#create a new subset of data excluding the rows that contain the outliers
###--------------INSTAGRAM CORRELATION--------------
##Correlation: Instagram engagement rate and Instagram post per day
#outliers of instagram engagement: Higher Education 2019
#outliers of instagram post per day: Sports Teams 2022
#Remove 2 rows with outliers from dataset
datos2 <- datos1 #here we use the standardised dataset
#we want to see the correlation graph with the real values
datos2 <- datos2[-c(21,69),]
View(datos2) #the columns containing the outliers are removed
cor_p_i <- cor(datos2$`INSTAGRAM ENGAGEMENT`,datos2$`INSTAGRAM POSTS PER DAY`) #pearson correlation
#cor_k_i <- cor(datos2$`INSTAGRAM ENGAGEMENT`,datos2$`INSTAGRAM POSTS PER DAY`, method = "kendall") #kendall correlation
#cor_s_i <- cor(datos2$`INSTAGRAM ENGAGEMENT`,datos2$`INSTAGRAM POSTS PER DAY`, method = "spearman") #spearman correlation
cor_test_i <- cor.test(datos2$`INSTAGRAM ENGAGEMENT`,datos2$`INSTAGRAM POSTS PER DAY`)
#correlation coefficient and significance level (p-value)
plot(datos2$`INSTAGRAM ENGAGEMENT`,datos2$`INSTAGRAM POSTS PER DAY`)
###--------------TRANSVERSE STUDY OF INSTAGRAM--------------
#i use standardised data and i removed outliers -> datos1
#YEAR 2022
inst_data2022<-datos1[57:70,]
```

```
inst_coR 022 <- cor(inst_data2022$`INSTAGRAM ENGAGEMENT`,inst_data2022$`INSTAGRAM POSTS PER DAY`) #pearson correlation
plot(inst_data2022$`INSTAGRAM ENGAGEMENT`,inst_data2022$`INSTAGRAM POSTS PER DAY`,
    col = c("seashell4", "red", "seagreen", "yellow", "green","lightcoral", "purple", "lightseagreen", "maroon1", "blue", "orange", "skyblue2", "black", "plum"),
    main = "2022 Instagram correlation",
    xlab = "Engagement rate",
    ylab = "Post per day",
    pch = 16)
legend(0.5, 3,
      legend = c("Alcohol", "Fashion", "Financial Services", "Food & Beverage", "Health & Beauty", "Higher Education", "Home Decoration", "Hotels & Resorts", "Influencers", "Media", "Non Profits", "Retail", "Sports Team", "Tech & Software"),
      fill = c("seashell4", "red", "seagreen", "yellow", "green", "lightcoral", "purple", "lightseagreen", "maroon1", "blue", "orange", "skyblue2", "black", "plum"),
      col = c("seashell4", "red", "seagreen", "yellow", "green", "lightcoral", "purple", "lightseagreen", "maroon1", "blue", "orange", "skyblue2", "black", "plum"),
      cex = 0.7)
###--------------LONGITUDINAL STUDY OF INSTAGRAM--------------
#i use standardised data and -> datos1
###---LONGITUDINAL STUDY OF INSTAGRAM - FASHION INDUSTRY---
which(datos1$INDUSTRIES == "Fashion")
Fashion_insta <- datos1[c(1,7,18,30,44,58),]
fashion_cor <- cor(Fashion_insta$`INSTAGRAM ENGAGEMENT`,Fashion_insta$`INSTAGRAM POSTS PER DAY`) #pearson correlation
plot(Fashion_insta$`INSTAGRAM ENGAGEMENT` ,Fashion_insta$`INSTAGRAM POSTS PER DAY`,
    col = c("plum", "yellow", "orange", "green", "red", "blue"),
    main = "Fashion industry instagram correlation",
    xlab = "Engagement rate",
    ylab = "Post per day",
    pch = 16)
legend(-1, 1,
      legend = c("2017", "2018", "2019", "2020", "2021", "2022"),
      fill =  c("plum", "yellow", "orange", "green", "red", "blue"),
      col = c("plum", "yellow", "orange", "green", "red", "blue"), cex = 0.8)
```