An Informetric View on Relations between Global Brands and Research Activity

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Abstract. The article identifies the relations between global brands and research activity during 2009 – 2018. Two types of relations are studied: support of the research by global brands and usage of the global brands in the research. The research support by 27 global brands and the global brands usage in the research are analysed over 2009 – 2018. The support is assessed by the number of papers in which the global brand is mentioned in the funding section. The usage is assessed by a number of papers in which the global brand is mentioned in the presentation part. The most generous and simultaneously popular brands are Google, Microsoft, IBM, Samsung and Facebook. In the last three years their support dynamics and usage dynamics are positive or strong positive.

Keywords: informetrics, global brands, research support, brands in research, Scopus, classification.

1 Introduction

Global brands rapidly penetrate into new spheres of influence, including research. The level of the infiltration can be assessed by the public "reports" of the scholars – by the scientific papers. Until now, such activity of the global brands has not been studied in a systematic way, only some particular studies were carried. For example, a bibliometric analysis of the scientific literature related to the use of Facebook in educational research is carried in [1]. The analysis is performed on Web of Science data. Scopus-based bibliometric analysis of the papers related to the use of Facebook and of YouTube in any research field is carried in [2] and in [3]. An evaluation of correspondence between Coca-Cola's "Transparency List" of funded researchers and a list of papers with scientific research acknowledging funding from Coca-Cola is performed in [4]. A list of the supported papers is taken from Web of Science Core Collection database. Paper [5] describes the scope of partnerships between Coca-Cola and 74 health organizations in Spain, examining marketing strategies contained in scientific papers funded by Coca-Cola between 2010 and 2016. A list of the supported health organizations was formed through PubMed. Papers [6], [7] and [8] study vari-

ous conflicts of interest between donors (Coca-Cola Company, Mars Inc.) and results of the supported research.

The impact of the global brands on the research activity is proposed to assess by two indices. The first index is the number of papers, where the global brand is mentioned in the presentation part. This index roughly assesses how the global brand is connected with the research activity. This connection can be in the form of some brand tools, technologies, recipes, datasets etc. It is possible that the global brand itself acts as an object of research. The second index is the number of papers, where the global brand is mentioned in the funding research section. This index enables to estimate roughly the financial support of the research by the global brands. Such informetric approach to identifying the various brand relations is becoming more and more popular. For example, paper [9] analyses B2B-branding papers during 1972 – 2015, paper [10] analyses analysed publications related to researches in brand personality during the 1995 – 2017, paper [11] identifies the leaders and the trends in branding researches during 2000 – 2019.

Our paper studies not only current state of "brands – research" relations, not only statistics on certain date. Informative figure is also the dynamics – change of the indices during some time interval. For data acquisition the Scopus base with the corresponding search services is applied.

2 Studied global brands

The studied global brands are selected from Top-100 list of the most expensive global brands of 2018 according to "Best global brands rankings" by Interbrand. All the homonymous brands that do not have the unique names are rejected. For instance, the word "apple" in the scientific papers is used not only as the name of the most expensive brand but also as an ordinary apple. Caterpillar is not only the producer of powerful road construction machinery but also ordinary caterpillar. Nike is not only sportswear but also one of the species of fish and the name of laser. Amazon and Honda have the geographical homonyms. Some short names of the brands coincide with the specific abbreviations, widely spread in certain research fields. For instance, NIKE is used as the abbreviation for "Non-Interactive Key Exchange", BMW – as "biomedical waste". In case of homonymy, automatic processing the query outputs from Scopus is complicated. For our study we have chosen the following 27 brands with unique names: Google, Microsoft, Coca-Cola, Samsung, Toyota, Facebook, IBM, Cisco, Louis Vuitton, Budweiser, Accenture, Hyundai, Ebay, Volkswagen, Goldman Sachs, L'Oréal, Adidas, Hewlett Packard, Morgan Stanley, Harley-Davidson, Netflix, Huawei, PayPal, John Deere, Spotify, Johnnie Walker, and Nintendo.

3 Brands classification based on statistics over 10 years

We have collected statistics about support of research by global brands as well as using the global brands in research over 10 past years. For 2D-distribution of the brands in the axes "support – usage" the data for the period of 10 years must be ag-

gregated in some way. The simplest way is summation of values for the 10 years. But naturally, the fresh data have the greatest impact on the current perception of the brand. The old papers produce the least impact. That is why, during the averaging we will normalize the indices, taking into account the various importance of the data. For the normalization of the support and usage, the following formulas are proposed:

$$U_N = \frac{1}{10} \sum_{i=2009,\,2018} w_i \cdot U_i \,, \tag{1}$$

$$S_N = \frac{1}{10} \sum_{i=2009,\,2018} w_i \cdot S_i \,, \tag{2}$$

where S_i denotes the number of the papers of the i^{th} year in which the corresponding global brand is mentioned in the section Funding; U_i denotes the number of the papers of the i^{th} year, in which the corresponding global brand in mentioned in the presentation part; w_i denotes weight coefficient of the i^{th} year.

We use arithmetic sequence of weight coefficients with decay 0.1, namely: $w_{2018} = 1$; $w_{2017} = 0.9$; $w_{2016} = 0.8$, ..., $w_{2009} = 0.1$. Hence, the impact of the events of the year 2009 is 10 times less than the events of the year 2018. 2D-distribution of the brands according to the normalized indices is shown in Figure 1.

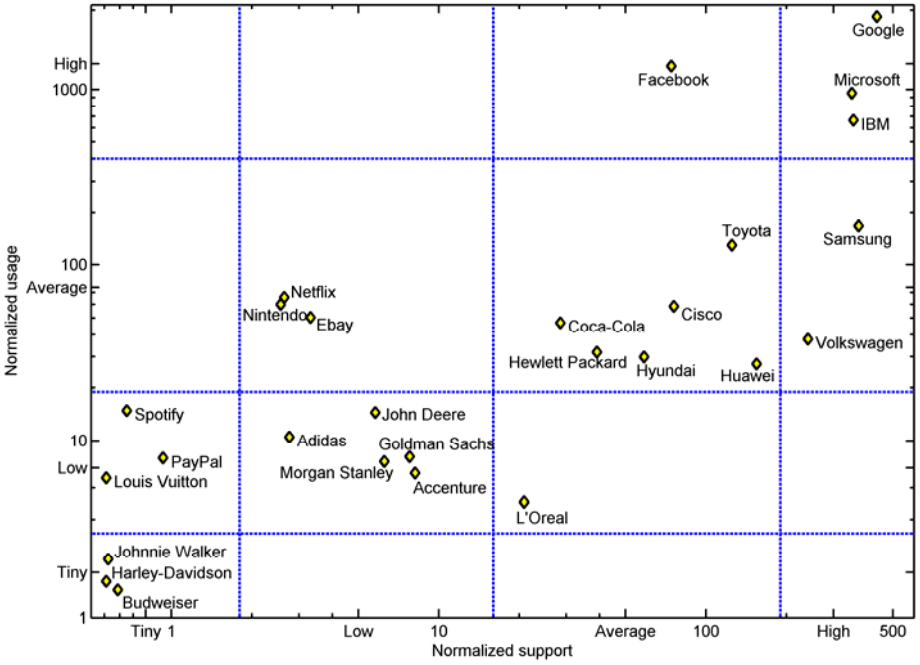

Fig. 1. Classification of the global brands in case of arithmetic sequence of weight coefficients with decay 0.1 (log-log scale)

By the ordinal scale {Tiny, Low, Average, High} 9 clusters are allocated on Figure 1. For example, the leader cluster High-High, the cluster with High Normalized Support and High Normalized Usage comprises the brands Google, Microsoft and IBM.

In Figure 1 all the brands are located within the vicinity of the diagonal – each brand has similar or neighboring linguistic values of the normalized support and usage. There is no brand with High Support level and Low Usage level or vice versa, Low Support level and High Usage level. Greater part of the brands – 17 out of 27 are in the clusters with the equivalent levels of the Normalized Support and Normalized Usage. Twelve brands locate in the clusters High-High, High-Average, Average-High or Average-Average. Eleven out of twelve of these brands are referred to technologies, business services, automotive, and only one brand – Coca-Cola belongs to the food industry. The most generous and popular brands are located in the right upper corner of Figure 1. These brands are Google, Microsoft, IBM, Samsung and Facebook.

To checking the reliability of brands classification let us plot 2D-distributions in case of other weight coefficients in formulas (1) and (2). Figure 2 shows 2D-distribution for a geometric sequence of weight coefficients with ratio 0.9, namely: $w_{2018} = 1$; $w_{2017} = 0.9$; $w_{2016} = 0.9^2 = 0.81$, ..., $w_{2016} = 0.9^9 = 0.39$.

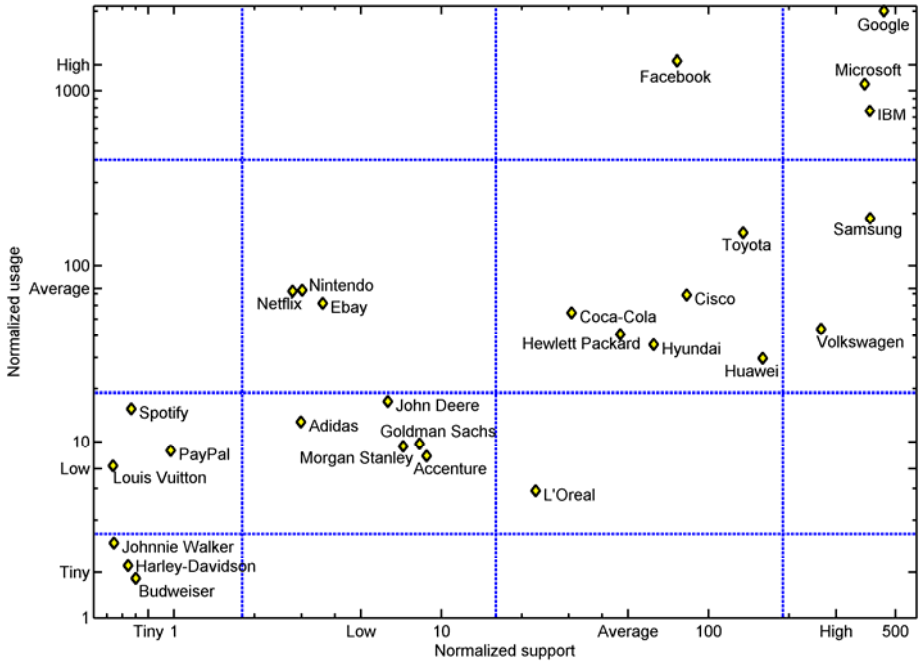

Fig. 2. Classification of the global brands in case of geometric sequence of weight coefficients with ratio 0.9 (log-log scale)

Figure 3 shows 2D-distribution for a geometric sequence of weight coefficients with ratio 0.8, namely: $w_{2018} = 1$; $w_{2017} = 0.8$; $w_{2016} = 0.8^2 = 0.64$, ..., $w_{2016} = 0.8^9 = 0.13$ Figures 1–3 show slight fluctuations of the brands without any change of the classifying results. Hence, the proposed classification is robust – it is not sensitive to reasonable change of weight coefficients in (1) and (2).

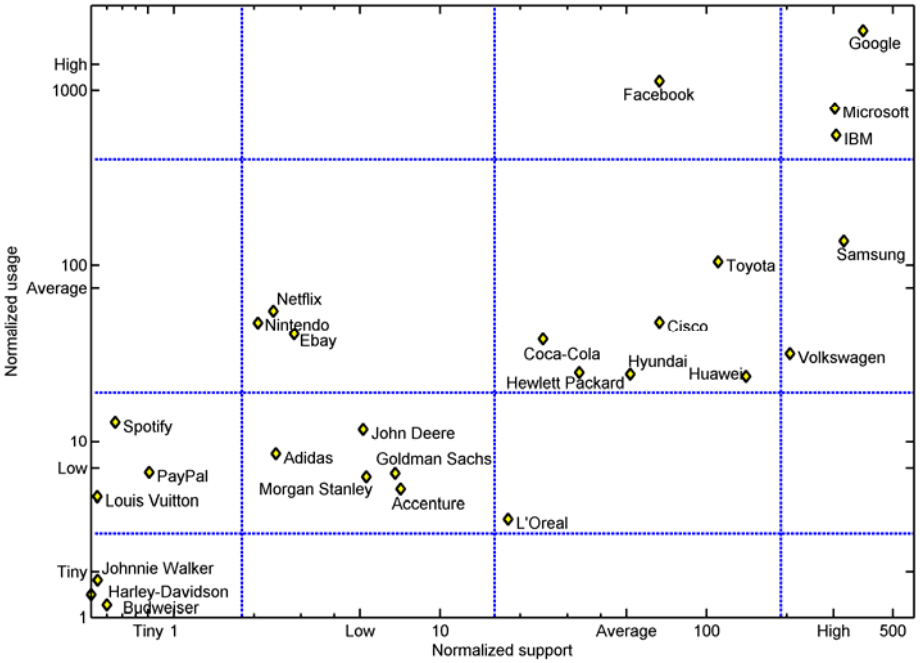

Fig. 3. Classification of the global brands in case of geometric sequence of weight coefficients with ratio 0.8 (log-log scale)

4 Support Dynamics

According to Figures 1–3 all the brands are divided into 4 groups by normalized support index. Let's analyse support dynamics of the brands from the groups with high, average and low support level. The dynamics of tiny support group is out of interest due to statistically insignificant number of cases.

Five brands Google, Microsoft, Samsung, IBM and Volkswagen are in the group with high support level. Time series of research support by those global brands are shown in Figure 6. There is no dominant leader among these brands. Just one brand – Google increased the number of supported papers every year. Google's support dynamics is very close to a cube function. Figure 4 shows that all the brands considerably increased their support during last 3 years. In 2018 Volkswagen supported 2.7

times more papers than in 2015, Samsung – 4.4 times, other brands – approximately three times. Average dynamics shows that 2015 looks like as a breaking point. An annual pace of support is equal to 22 during 2009 –2015 and has increased drastically up to 297 during 2015–2018.

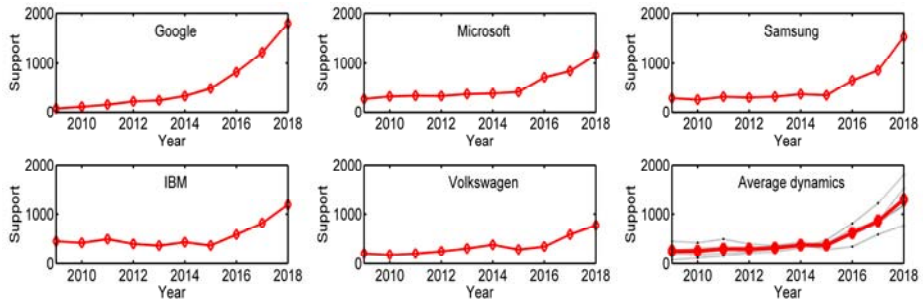

Fig. 4. Support dynamics for High support group

Eight brands are in the group with the average level of support. Annually they support 2–4 times less papers than the brands from the High support group. All the brands from Average group increased also their support in 2016-2018 but did it very unevenly (Figure 5). The slowest three-year pace demonstrates Coca-Cola – 2.3 times. The most rapid are Facebook – 4.7 times, and, especially, Huawei – 7.8 times. Huawei supported 727 papers in 2018, and only 93 papers in 2015. Huawei with such pace has a good change to move into the High support group during next year. Toyota is another brand in the candidate-list for the High support group.

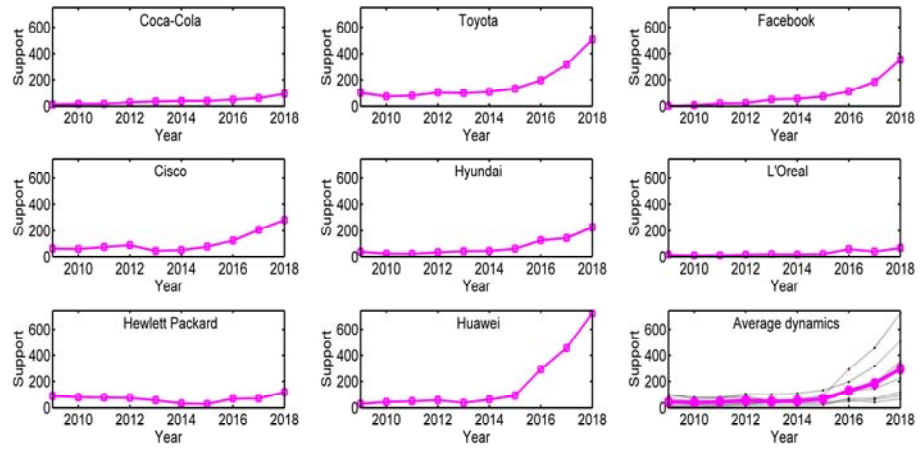

Fig. 5. Support dynamics for Average support group

On average, the brands of Average support group increased considerably the support during the last three years. We draw the attention to Average support group that

includes 2 brands from food industry and FMCG-industry. However, the level of their support is far less than IT, telecommunication and automotive brands.

Eight brands are in the Low support group (Figure 6). The greater part of the brands has zero-dynamic, i.e. the number of supported papers remains approximately the same. Exception is 2018, when all the brands besides Nintendo increased the number of supported papers significantly.

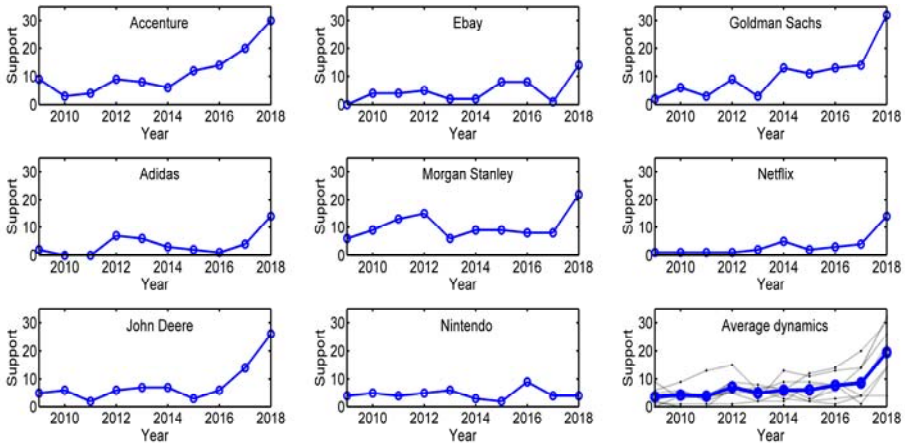

Fig. 6. Support dynamics for Low support group

5 Usage Dynamics

Among the analysed brands the researchers most often use Google. Since 2016 the number of papers, in the presentation part of which Google is mentioned, exceeded 5000 annually. Facebook, Microsoft and IBM are also among the leaders (Figure 7). All four brands stable growth of their usage in research during the last several years. However, Google has highest pace with almost quadratic dynamics during all the years.

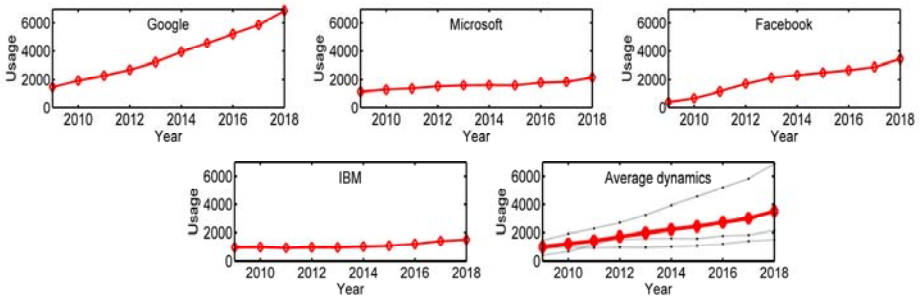

Fig. 7. Usage dynamics for High usage group

Average usage group comprises nine brands (Figure 8). Samsung and Huawei have good positive dynamics during almost all the years. The usage of remaining brands of this group is either stable of slightly decreases. As a result, the average usage is stable for this group.

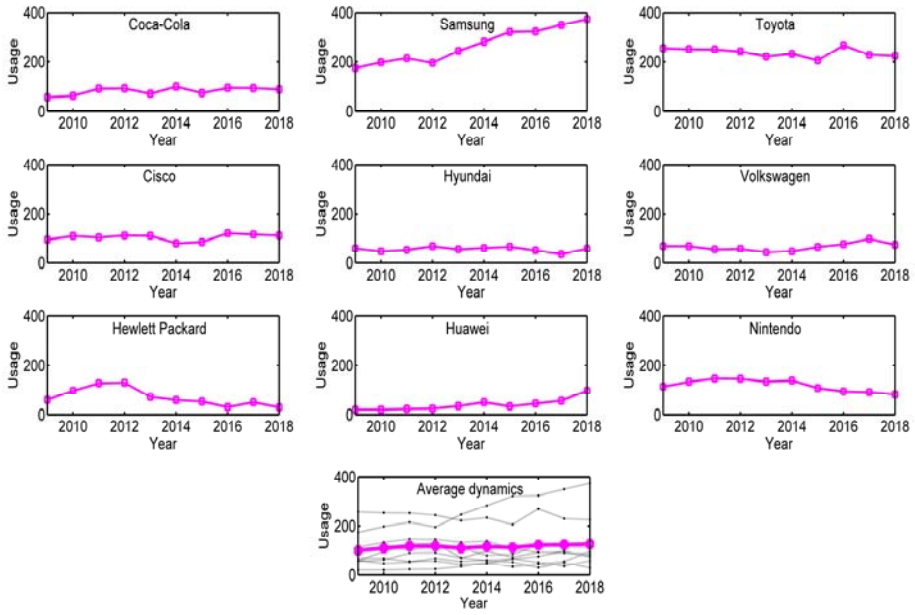

Fig. 8. Usage dynamics for Average usage group

Nine brands has formed Low usage group (Figure 9). Ebay demonstrates strong negative dynamics. Probably, Ebay-phenomenon as a research object loses the attractiveness. Spotify has reliably positive dynamics. Usage of the rest of the brands of this group during 10 years is more or less stable.

Resuming the data from all the groups, we conclude that strong positive dynamics of the usage is demonstrated only brands related with information services, information resources, media, and electronics.

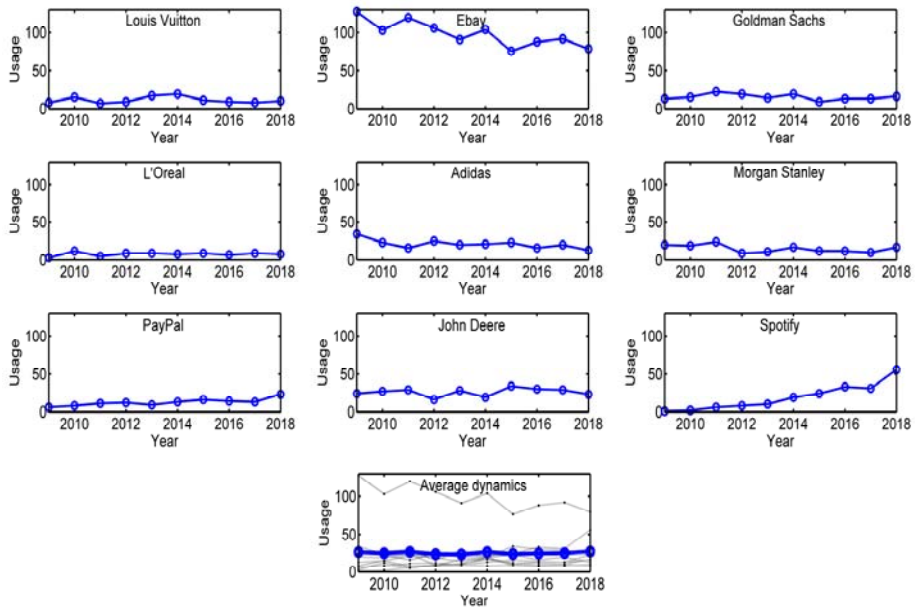

Fig. 9. Usage dynamics for Low usage group

6 Conclusion

The research support by 27 global brands as well as their global brands usage in the research during the last 10 years has been studied. The analysis is based on the informetric approach with Scopus data. The support was assessed by the number of papers where the global brand is mentioned in the funding section. The usage was assessed by the number of papers, where the global brand is mentioned in the presentation part.

The statistics about support of research by global brands as well as using the global brands in research over 10 past years were aggregated. The aggregation in form of weighted sum with the highest impact for data of 2018 and the lowest impact for data of 2009 is proposed. Nine clusters of brands are inducted by 2D-distribution according to the normalized indices of support and of usage in log-log scale. The proposed classification is robust – it is insensitive to reasonable change of weight coefficients.

According to the normalized level of support, all the brands are divided into four groups with high, average, low and tiny levels. All the brands with high and average levels are characterized by the considerable growth of the number of the supported papers during 3 last years. This can be explained by the increase of funding and (or) growth of the requirements to the grant recipients, concerning the obligation to mention the source of funding in the corresponding section of the paper. Regarding to group with low level, the greater part of the brands has zero-dynamics. Exception is 2018, when all the brands besides Nintendo increased the number of supported papers significantly.

According to the normalized level of usage all the brands are divided into 4 groups with high, average low and tiny levels. For the group with high level stable considerable growth of the brand usage in the papers during all 10 year is characteristic. High usage group consists of Google, Microsoft, Facebook and IBM. Also Samsung and Huawei from Average usage group and Spotify from Low usage group have good positive dynamics during almost all the years. Hence, the strong positive dynamics of the usage is demonstrated only information-centered brands.

It is revealed that the most generous and simultaneously popular brands are Google, Microsoft, IBM, Samsung and Facebook. All these five top brands are connected with the information systems and services. In the last three years their support dynamics and usage dynamics are positive or strong positive. This enables to put forward the hypothesis that the strong connection of the brand with research stimulates further strengthening of these relations. That is, the effect that "strong becomes stronger" is observed also in the relations between global brands and research activity. For the verification of this hypothesis the additional statistics for several future years is required.

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