Relation between Wikipedia edits and news published

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This research looks at the relation between the number of Wikipedia edits on corporate pages and the number of news published by English newspapers over a specified time span. Contrary to previous studies that only focused on the relation between Twitter or Facebook and present incidents, the goal of this paper is to show if and how Wikipedia entries are affected by current events. The new insights could help companies generate and keep a good corporate image that helps with sales, customer loyalty or customer acquisition.
Through showing that some scandals did affect the corporate Wikipedia pages, it can be stated that the site can act as a source of information for users or news outlets and that companies need to take Wikipedia as a public relations tool into account.

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1. INTRODUCTION

Currently there is a Wikipedia entry for nearly every big company with the information about the business, its products or services and potential criticism or scandals. Individuals not directly related to the company itself mostly edit this entry – or Wikipedia page – resulting in discussions concerning future changes.

Social media platforms as a way to communicate with the company's target audience are a part of the on-going marketing process, more precisely public relations. These on-going marketing processes help selling more products or services.

The goal of this research is to show if there is a relation between the number of news published by English newspapers and the number of edits on a corporate Wikipedia entry over a specified time span. The outcome could help companies understand the dynamics of Wikipedia itself (e.g. how fast news spread and how accurate the added information is) and if it affects the public image of the business. According to Hsieh & Li (2007), "[…] consumers' perception of an organization's PR practice is an antecedent of loyalty. The impact of public relations perception (PRP) on customer loyalty is stronger and more significant when the brand image is favourable." (p. 26) Due to the fact that many consumers inform themselves online about the product they want to buy and about the company behind the product or service, a good and positive Wikipedia entry is favourable.

This will be accomplished by answering the main research question:

How does the amount of edits on corporate Wikipedia pages relate to the number of news published by English newspapers about that company?

The final result should demonstrate if Wikipedia is as important as Twitter or Facebook as a way of generating and keeping a good public reception.

Most of the current literature only focuses on Twitter and Facebook as public relation platforms while only a few research papers use Wikipedia as a news story detection tool or as a way of linking past news to Wikipedia events as done by Berberich et al. (2014).

Rybalko & Seltzer (2010) examine in their study how Fortune 500 companies communicate with consumers and other stakeholders using Twitter. They state that social media tools

have to be used in a right way to generate good and long lasting relationships.

According to Waters et al. (2009), "Social networking sites can be an effective way to reach stakeholder groups if organizations understand how their stakeholders use the site." (p. 106)

These two examples – albeit not using Wikipedia as base of their research – show that companies have to understand how their target audience uses the different sites and how it affects their image of the corporation.

This paper builds on these already known results and tries to analyse the group collaboration activity at different points in time. The outcome of this research then shows if there is a relation between published news and afore-mentioned activity on Wikipedia and the strength of the possible connection.

The following sections consist of the underlying theory behind this research including a review of existing literature on Wikipedia itself, the site as a news detection utensil and Wikipedia as a group collaboration tool, a description of the method used to obtain the required data, an analysis of said data followed by a discussion and a conclusion.

2. THEORY

As mentioned in the introduction, this research uses Wikipedia as a base of examination. Reagle (2010) describes Wikipedia in his book as "a community, but one formed through a practice, or a doing-collaboration. That collaboration happens within a culture, or a set of norms, guided by principles that the community accepts and fights about, and through that struggle defines." (p. x) Furthermore, he states "[…] Wikipedia is both a community and an encyclopedia. And the encyclopedia, at any moment in time, is simply a snapshot of the community's continuing conversation." (Reagle, 2010, p. 1)

Wikipedia describes itself as "[…] a work in progress. Collaborative editing means that incomplete or poorly written first drafts can evolve over time into excellent articles." (Wikipedia, 2015, para. 5) Moreover they state, "Nobody owns articles. If you see a problem that you can fix, do so." (Wikipedia, 2015, para. 16) This results in many Wikipedia-editors, most of whom are anonymous – meaning it cannot be identified which person is behind a particular edit.

Hafner (2007) wrote in her article for the New York Times that edits for the entry of SeaWorld "[…] originated at a computer at

Anheuser-Busch, SeaWorld's owner." (para. 2) This, in addition to the Pepsi-incident in which the by Wikipedia monitored IP-addresses showed employees using the company network to delete paragraphs about the negative health effects, shows that the aforementioned anonymous editors can be employees that represent the companies interest but also opponents of the association.

Contrary to this DiStaso (2012) states that "the majority of public relations / communication professionals in this study had never tried to make changes to their company or client's Wikipedia articles. The comments on the survey indicate that this is so low because many respondents were afraid of media backlash and uncertainty what to do." (p. 18)

This continuing conversation, its resulting edits – the dependent variable – and the different, sometimes opposing, parties involved form the base of this research and are compared to the number of news published by English newspapers – the independent variable.

The related research of Osborne et al. (2012) tried to "explore the extent that event detection, in particular first story detection, based on Twitter" (p. 1) correlates to the number of page views on different Wikipedia pages. They "compare the resultant tweets [for a specific keyword] and Wikipedia pages over textual and time dimensions to identify the types of information that are common across these two information streams and the latencies inherent to this form of information sharing." (Osborne et al., 2012, p. 1) The paper concluded that there is a correlation and a delay of about two hours between the appearance of a news story on Twitter and the research of information on Wikipedia. This outcome suggests and underpins the probability of an existing relation between the number of Wikipedia edits and the number of news published by newspapers due to the increasing interest and traffic generated by an event.

Reagle (2010) describes in his book "In early 2005, members of the Stormfront, a "white pride" online forum, focused their sights on Wikipedia. In February they sought to marshal their members to vote against the deletion of the article "Jewish Ethnocentrism" […]." (p. 1) This indicates the fact that specific groups try to damage the reputation of other groups by editing (or in this case the attempt to manipulate the deletion) Wikipedia entries which is applicable to this research (Google & Android "fanboys" vs. Apple & iOs "fanboys").

Deriving from the small description and the relevant literature an underlying theoretical framework can be chosen – the Game Theory. Osborne (2004) states that the "Game theory aims to help us understand situations in which decision-makers interact." (p. 1) Further he states that it can be applied to situations in which businesses compete with each other. It is the study of strategic decision-making and in this case, the extensive form game is used.

Concerning the extensive form, Fudenberg & Krebs (1995) state, "The behaviour of each player at any date t will depend […] on what each player believes to be the joint strategies being chosen by its rivals." (p. 24)

It can be argued that due to the nature of Wikipedia, new information concerning a company is always added to the entry to keep everything up-to-date. Therefore the company or the group who are affected by an event or a scandal need to react first in order to achieve a favourable outcome.

The extensive form game after a specific event or scandal can be explained as follows:

- The current state of a Wikipedia article symbolizes the starting point of the extensive form tree.
- Player 1 (the company or group who is affected by the scandal) has the possibility to choose between doing nothing (CN) and editing the Wikipedia page in their favour (CY). Doing nothing (CN) would, as mentioned, still result in the information being published but with an unknown payoff. This leaves editing the page (CY) as the choice maximizing player 1's reward.
- Player 2 (a competing company or group) sees player 1's move and has the possibility to either react (AY) (revert the edit or edit in disfavour of player 1) or do nothing (AN) with choice (AY) being the choice with the maximum payoff for player 2.
- This reaction and counter-reaction result in a specific payoff situation for player 1 and player 2 (the new current state of the Wikipedia article).

The different probable payoffs and probabilities would be:

- CN/AN: No group gains anything when no one edits the page. The probability for this situation is low.
- CN/AY: Only player 2 receives a payoff when it takes action after player 1 decided not to edit the entry. The

probability for this situation is higher than CN/AN but still low. This outcome has the biggest payoff for player 2.

- CY/AN: Only player 1 receives a payoff when the company does take action but player 2 decides not to edit the entry. The probability for this situation is high because the only possible way to maximize the payoff for player 1 is to edit. This outcome has the biggest payoff for player 1.
- CY/AY: This has a smaller payoff for player 1 because player 2 decides to take action but as mentioned before it has the highest probability because both parties try to maximize their payoff. This can be only done if player 1 choses to edit the entry and if player 2 choses to counter-react and revert the edit or edit in disfavour.

This "extensive form game"-description and the possible course of actions and different payoffs can be applied to this research. It shows that the strategy of editing the Wikipedia page leads to the most favourable outcome for both companies resulting in the need for company A to act first.

The game theory is the underlying framework for the expected behavioural pattern of two competing companies and groups with one trying to confine the damage as much as possible to still keep a positive public image while the other one is trying to damage the competitors' image and by this gaining an economic advantage.

Based on this theory one could assume that after a scandal (or the increase of news published by English newspapers) the number of edits done by Wikipedia's users would increase due to the fact that the various players make their moves / counter-moves to maximize their respective payoffs and to steer the outcome and the tone of the edit in a favourable way.

Company or group A tries to confine the damage as far as possible resulting in potential sugar-coating of the event whereas company or group B tries to do the opposite. Oppong (2014) states in his book various methods of manipulating Wikipedia articles in favour of the own company. These methods consist of:

- Mentioning new products or changing / updating business numbers

- Communicating with other "normal" users so relevant information gets added to the article
- Deleting content
- Editing content
- Deception
- Deletion of competitive articles

Depending on the severity of the scandal (measured by the amount of news published), the severity of the discussion ascends due to the fact that every party involved tries to benefit as much as possible from the current situation.

Summarizing one can assume that during a scandal the number of Wikipedia page edits rises whereas it should stay the same during the other time-periods.

3. METHOD

The data for this research thesis was obtained using Contropedia and LexisNexis.

Contropedia is a website that collects information on Wikipedia entries and shows the respective controversial elements, the level of controversion, the edit activity and controversiality, and the number of involved users.

For each company, a Contropedia-page listing the 20 most controversial elements for that Wikipedia entry was used to collect data on the total number of edits made during a set time span.

The afore-mentioned number of edits for each page were grouped by month and pasted into an Excel-worksheet. Table 1 shows an example of the number of edits made on the Apple Wikipedia entry between May 2009 and September 2009.

Table 1. Example Excel-worksheet (Apple, # edits)

2009-05	178
2009-06	186
2009-07	149
2009-08	129
2009-09	81

LexisNexis Power Search was used for accessing the number of news published by English newspapers. The particular search

queries consisted of a monthly time span, the different companies and the source "newspapers".

The number of results for each search query was then written down next to the respective month in the above-mentioned Excel-worksheet. Table 2 shows an example of the number of search results (= the number of news published) for the company Apple for each month between May 2009 and September 2009.

Table 2. Example Excel-worksheet (Apple, # news)

2009-05	615
2009-06	1116
2009-07	959
2009-08	960
2009-09	997

The next steps consisted of doing a regression analysis in addition to adding the numbers to SPSS to calculate different correlations using the "Pearson-Correlation" resulting in the tables seen in the analysis.

4. ANALYSIS

In this part, a regression analysis is used to initially compare the independent variable (the number of news published) to the dependent variable (the number of Wikipedia edits).

A regression analysis is a "statistical measure that attempts to determine the strength of the relationship between one dependent variable (usually denoted by Y) and a series of other changing variables (known as independent variables)." (Investopedia, 2015, para. 1)

For every method the following data sets are being used:

- Number of edits and number of news published over the complete lifespan of the Wikipedia article grouped by months.
- Number of edits and number of news published between 2010 and 2014 grouped by months for noteworthy findings.

4.1. Regression Analysis

The regression analysis is conducted using Excels data analysis function.

The resulting "R Square" is "a statistical measure of how close the data are to the fitted regression line. It is also known as the coefficient of determination, or the coefficient of multiple determination for multiple regression. […] The higher the R-squared, the better the models fits [the] data." (Frost, 2013, para. 5)

If the examined data returns a relatively high "R square", the "Significance F" is inspected. A significance under 0.05 shows a meaningful correlation between the data sets.

Table 3 shows the outcome of the regression analysis of the first two data sets (complete lifespan and 2010 – 2014).

The only noteworthy finding in this analysis is BP's R squares of $\approx$ 0.45 and $\approx$ 0.41. These numbers imply that 45% (respectively 41%) of the variation in number of edits is explained by the number of news published (independent variable). Furthermore the significance for both numbers is below 0.05 resulting in the outcome being reliable (statistically significant).

Table 3. Regression analysis for the number of Wikipedia edits and the number of news published over two timespans

	Lifespan		*2010 - 2014*
Apple			
R Square	0,012607517		0,011765086
Apple Criticism			
R Square	0,001980552		0,017638288
BP			
R Square	0,446154027		0,412609655
Significance F	1,19077E-18		4,15731E-08
Burger King			
R Square	0,004868523		0,011247317
Deloitte			
R Square	0,000450423		0,003148934

Table 3. Continued

	Lifespan		*2010 - 2014*
Google			
R Square	0,200275969		0,116133143
Significance F	1,67181E-07		0,008262079
Google Criticism			
R Square	0,017307931		0,030808128
HSBC			
R Square	0,0103442		0,003604443
JP Morgan			
R Square	0,118836448		0,002949773
Significance F	4,83787E-05		
Microsoft			
R Square	0,001942486		0,014027103
Microsoft Criticism			
R Square	0,000196946		0,001185762
Monsanto			
R Square	0,049853219		0,002719368
Nestle			
R Square	0,011772671		0,013723454
Pricewaterhouse			
R Square	0,000226602		0,01674973
Shell			
R Square	0,000355115		0,002038153

Based on the previous regression analysis table 4 was generated showing a more detailed view of the results of BP's dataset "2010 – 2014" to further examine the findings.

The table shows a high R square for 2010 (the year of the "Deepwater Horizon Oil Spill") and a relatively high R square for 2011 followed by a complete drop to no significance for 2012, 2013 and 2014.

After the explosion and sinking of a BP-owned prospect, oil flowed for 87 days until it could be stopped. During these 87 days, the US Government estimated that 4.9 million barrels of oil were spilled causing one of the largest oil spills in the history.

The data shows that during this time, more than 1500 Wikipedia edits were made. Furthermore these edits did not stop in 2010 but carried over to 2011.

Table 4. Regression analysis for the number of Wikipedia edits and the number of news published for BP between 2010 and 2014

2010	
R Square	0,850986488
Significance F	5,25573E-05
2011	
R Square	0,677927015
Significance F	0,001843605
2012	
R Square	0,000708611
2013	
R Square	0,003722784
2014	
R Square	0,001785594

These preliminary results show that only one big event (BP oil spill) and the corresponding number of news published had an effect on the number of Wikipedia article edits.

4.2. Correlation

The correlation is measured using SPSS and the "Pearson's product-moment correlation coefficient".

"The correlation coefficient ranges from -1 to 1. A value of 1 implies that a linear equation describes the relationship between X and Y perfectly, with all data points lying on a line for which Y increases as X increases. A value of -1 implies that all data points lie on a line for which Y decreases as X increases. A value of 0 implies that there is no linear correlation between the variables." (Wikipedia, 2015, para. 9)

Table 5 shows the Pearson coefficient of the first two data sets (complete lifespan and 2010 – 2014). As well as for the regression analysis, one of the noteworthy findings is BP with a Pearson Correlation of 0,669 (respectively 0,643). The other significant results are:

The absence of correlation in the second dataset of JP Morgan and Monsanto implies that further research has to be done with data sets that predate 2010.

Table 5. Correlation between number of Wikipedia edits and number of news published over two timespans

	Lifespan		*2010 - 2014*
Apple			
Pearson Correlation	-,105		,109
Sig. (2-tailed)	,192		,406
Apple Criticism			
Pearson Correlation	-,062		-,120
Sig. (2-tailed)	,627		,374
BP			
Pearson Correlation	,669		,643
Sig. (2-tailed)	,000		,000
Burger King			
Pearson Correlation	-0,069		-,110
Sig. (2-tailed)	,415		,417
Deloitte			
Pearson Correlation	-,009		-,052
Sig. (2-tailed)	,923		,694
Google			
Pearson Correlation	-,439		-,339
Sig. (2-tailed)	,000		,008
Google Criticism			
Pearson Correlation	-,114		-,174
Sig. (2-tailed)	,270		,184
HSBC			
Pearson Correlation	,109		,072
Sig. (2-tailed)	,203		,585
JP Morgan			
Pearson Correlation	,351		,048
Sig. (2-tailed)	,000		,715
Microsoft			
Pearson Correlation	,044		-,117
Sig. (2-tailed)	,577		,374
Microsoft Criticism			
Pearson Correlation	,017		,016
Sig. (2-tailed)	,860		,913

Table 5. Continued

	Lifespan		*2010 - 2014*
Monsanto			
Pearson Correlation	,229		,051
Sig. (2-tailed)	,007		,700
Nestle			
Pearson Correlation	-,104		-,104
Sig. (2-tailed)	,225		,432
Pricewaterhouse			
Pearson Correlation	-,013		,131
Sig. (2-tailed)	,878		,319
Shell			
Pearson Correlation	,025		,040
Sig. (2-tailed)	,765		,764

Based on the previous correlation analysis table 6, table 7, table 8 and table 9 were generated showing a more detailed view of the results of BP's dataset "2010 – 2014", the results of Google's dataset "2010 – 2014" and new data sets for JP Morgan and Monsanto to further examine the findings.

Table 6. Correlation between number of Wikipedia edits and number of news published for BP between 2010 and 2014

2010	
Pearson Correlation	,926
Sig. (2-tailed)	,000
2011	
Pearson Correlation	,864
Sig. (2-tailed)	,000
2012	
Pearson Correlation	,033
Sig. (2-tailed)	,920
2013	
Pearson Correlation	-,036
Sig. (2-tailed)	,912
2014	
Pearson Correlation	-,018
Sig. (2-tailed)	,956

Just as the regression analysis, the table shows a high correlation for 2010 and 2011 followed by a complete drop to no significance for 2012, 2013 and 2014.

Table 7. Correlation between number of Wikipedia edits and number of news published for Google between 2010 and 2014

2010	
Pearson Correlation	-,395
Sig. (2-tailed)	,204
2011	
Pearson Correlation	-,062
Sig. (2-tailed)	,847
2012	
Pearson Correlation	,395
Sig. (2-tailed)	,204
2013	
Pearson Correlation	,184
Sig. (2-tailed)	,568
2014	
Pearson Correlation	,469
Sig. (2-tailed)	,124

Table 8. Correlation between number of Wikipedia edits and number of news published for JP Morgan between 2005 and 2009

2005	
Pearson Correlation	,183
Sig. (2-tailed)	,569
2006	
Pearson Correlation	-,484
Sig. (2-tailed)	,111
2007	
Pearson Correlation	,265
Sig. (2-tailed)	,405
2008	
Pearson Correlation	,768
Sig. (2-tailed)	,003
2009	
Pearson Correlation	,189
Sig. (2-tailed)	,557

The more detailed views of Google and Monsanto show no further significance, which leads to the conclusion that no correlation exists.

Table 8 on the other hand shows a correlation between the number of Wikipedia edits and the number of news published for the year 2008 which was the year in which JP Morgan Chase acquired Bear Stearns and the Washington Mutual.

Table 9. Correlation between number of Wikipedia edits and number of news published for Monsanto between 2005 and 2009

2005	
Pearson Correlation	-,023
Sig. (2-tailed)	,943
2006	
Pearson Correlation	,036
Sig. (2-tailed)	,912
2007	
Pearson Correlation	-,469
Sig. (2-tailed)	,124
2008	
Pearson Correlation	-,120
Sig. (2-tailed)	,711
2009	
Pearson Correlation	,505
Sig. (2-tailed)	,094

The correlation analysis confirms the outcome of the regression analysis showing that the only significant event was the BP oil spill and it's coverage in 2010 and 2011. In addition to this event, the analysis showed a relation between the JP Morgan Chase news coverage and the edits for the year 2008.

For the other companies and years, no correlation could be found despite the fact that there were several other extensive events.

Some examples of mentioned events include:

- Various Apple scandals ("Antennagate", Foxconn)
- The 2014 Burger King scandal that resulted in the shutdown of 89 franchise stores
- Various GMO-scandals related to Monsanto
- The JP Morgan Chase trading loss
- Various scandals related to Nestle and the purchase of water or the baby milk scandal

4.3. Summary

In conclusion, it can be said that contrary to the initial theory that after a scandal or a major event the number of edits would increase due to the fact that two opposing parties try to maximize their payoff, only with one event a regression and with two major events a correlation could be found, although various other scandals happened during the different time spans.

The severity of the "Deepwater Horizon oil spill" resulted in a reaction of various governments, which lead to a call for greater accountability and new legislations. Furthermore bad press, public apologies and finally the resignation of Tony Hayward followed the event. Google Trends showed a showed that the interest in the company and the scandal almost quintupled in 2010. In coherence with that the Wikipedia traffic of that entry changed from 68.259 views in April 2010 (17.165 of these on April 30th) to 463.917 views in May 2010, so an increase of over 500%.

In the course of the worldwide financial crisis in 2008, the acquisition of the – at that time biggest – US-savings bank, Washington Mutual, through JP Morgan Chase nearly doubled the interest in the company according to Google Trends. This acquisition affected million customers in the US and was accompanied by substantial news coverage in all medias. During that time the Wikipedia traffic of that entry increased from 4.989 views in August 2008 to 15.675 views in September 2008.

Summarizing, the analysis shows that there is no direct relation between the number of news published and the number of Wikipedia edits for the different companies except for the afore-mentioned cases which both had excessive media coverage in all media outlets and big public interest due to the discussed severity and impact of the events.

This refutes the initial assumption of the game theory and shows that the companies and groups did not try to profit from scandals emerging in controversial discussions and thus generating more edits.

5. DISCUSSION

Other research showed that companies heavily rely on social media platforms to communicate with their customers and by this are trying to shape a positive corporate image. This image is furthermore influenced by the information a consumer can find about the respective company. Therefore it was expected that the different corporations try to change or manipulate the Wikipedia entries to a more favourable picture – as seen in the SeaWorld or Pepsi editing-cases – and by this raising the number of edits made on the pages.

The results of this research contradict this expectation, it can be stated that there is no relation between the number of Wikipedia page edits and the number of news published by English newspapers except for some cases.

These cases showed that parallels only could be found during a scandal / specific moment with such a great importance that it affected many people around the world (BP or the various acquisitions done by JP Morgan Chase). For these cases a relation could be found using the regression analysis and the Pearson correlation showing a high significance. The other cases and data sets showed no relation meaning that the number of edits was independent from the number of news.

It can be stated that companies need to take Wikipedia into account when considering public affairs due to the fact that it serves as a source of information after a scandal (as seen by the increased traffic) and can affect the public image a company has.

Unfortunately this research had some limitations, one of which was LexisNexis. The page made it difficult to collect data when more than 3000 results were found over a specific time span.

Furthermore the data sets were limited to data collected using Contropedia for the number of Wikipedia edits and LexisNexis for the number of news published due to the fact that Contropedia currently the only site displaying and calculating the controversy of edits and showing the different statistics over time is.

6. CONCLUSION

The research question:

How does the amount of edits on corporate Wikipedia pages relate to the number of news published by English newspapers about that company?

Could be answered with this research. It showed that there was no relation between these two data sets except for significant moments in time that affected many people around the world.

As mentioned in the previous sections, Wikipedia is used as an information-gathering source for everyday-users and other third parties. This makes it an important tool in public relations that has to be taken into consideration. Although companies cannot hide or change the course and outcome of an event or scandal in the entry, they can try to monitor the objective coverage of information and report subjective edits.

As the paper and the approach used did not give much results, the need for further research on this topic is dropped.

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