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Exploring new ways to utilise the market intelligence (MI) function in corporate decisions: Case opinion mining of nuclear power

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ABSTRACT The challenge in today's corporations is that even though the technology portfolio of a company plays a crucial role in delivering revenue—falling as a topic mainly under the area of technology management—technology may have a negative image due to observed risks or failing the sustainability criteria. It may influence the company's image and brand image, possibly also influencing decisions at corporate level. The monitoring of technology sentiments is therefore emphasized, benefiting from the advanced methods for business environment scanning, namely market and competitor intelligence functions. This paper utilizes a new big data based method, mostly utilized in market(MI)/competitor intelligence(CI) functions of the company, opinion mining, to analyse the global media sentiment of nuclear power and projects deploying the technology. With this approach, it is easier to understand the linkage to corporate images of companies deploying the technology and also related corporate decisions, mainly done in the areas of technology market deployment, marketing and strategic planning. The results indicate how the media sentiment towards nuclear power has been mostly negative globally, particularly in social media. In addition, results from similar analyses from a single company's images for the companies currently deploying the technology are seemingly less negative, indicating the influence of company's communication and branding activities. This paper has implications showing that a technology's media sentiment can influence a company's brand image, marketing communications and the need for actions when technology is deployed. In conclusion, there seems to be a need for better co-operation between different corporate functions, namely technology management, MI, marketing and strategic planning, in order to indicate technology image impacts and also counteract firestorms from social media.

KEYWORDS Company media analysis, editorial media, learning machine, market intelligence, media-analysis, nuclear power, opinion mining, social media, web intelligence

1. INTRODUCTION

New applications based on web intelligence, digitalization and social media analytics are currently being studied in different research branches. Competitive and technological intelligence (CTI) tools are used in companies and research organizations to get the best efficiency out of a market monitoring process, and when these tools develop, more and more companies will be looking for monitoring and management of strategic information (Fourati-Jamoussi, F *et al*., 2018). In recent years, social media has increased in importance for social networking and content sharing, and services such as Twitter can be used for various analyses. For example to forecast box-office revenues for movies, based on sentiment and quantity, it can now outperform purely market-

based predictors (Asur, S. & Huberman, B, 2010). In a study by Søilen *et al*., 2017, Twitter was seen as a source of analysis, what information is being tweeted and not tweeted, thus professional users are aware that tweets are being manipulated by communication departments. Twitter has also been considered as a source for detecting disruptive events (Alsaedi *et al*., 2017). Furthermore, many companies utilize social media data for analyses, such as likes, comments, and sentiment by using lexicon-based classification to categorize the sentiment of users' comments (Yulianto, M. *et al*., 2018), like it was in this study.

For a company-wide view, individuals and organisations are now adopting public opinions presented across the media to their corporate decision making (Liu *et al.,* 2012). By adopting these faster than before, almost in real time, feedback from media sentiment to a change of a company's product can influence decision-making processes of the company. Media activities generated by consumers that are neither paid or induced by brand owners are seen to have a potentially game-changing impact on communication and brand building (Corstjens, M. & Umblijs, A. 2012). What if the large quantity of negative information about a company's product would flow suddenly by word of mouth (WOM) from social media (SoMe)? In reaction to any questionable statement or activity, social media users can create large waves of outrage rapidly, and these online firestorms pose new challenges also for marketing communications (Pfeffer *et al*, 2014). Social media monitoring can be efficiently dealt with via a company's market intelligence (MI) function.

To highlight case-specific features of this paper, when nuclear power generation technologies are concerned in the combat against climate change, nuclear power can be considered to be one possible mitigation strategy, due to the extremely low carbon dioxide emissions during the energy resource's life-cycle (Dones *et al*., 2003). If carbon emissions are reduced also in developing economies, alternative energy sources in the form of green technologies should be deployed as substitutes for coal and petroleum (Ganda, 2018). The public perception of nuclear power is however an essential factor influencing whether the technology is used for producing electricity (Goodfellow *et al*., 2011). By relying on nuclear power, a country could be virtually independent from foreign energy sources, and thus gain energy supply security. For example, should fossil fuel reserves become insufficient, other cheap energy sources would be needed to fill the gap (Roth *et al*., 2009). Hence, the supporters of nuclear power currently apply two main arguments, firstly nuclear power can secure the fulfilment of our energy demands, and secondly, it is CO_2 neutral, and would therefore be an effective mitigation strategy against climate change (Bang, 2010). Nuclear energy falls short on sustainability criteria and its public acceptance can be an issue (Verbruggen, 2008). Nuclear technologies, despite their enhanced safety, reduced costs and minimised waste, still include the burden of the weapons proliferation, safety, waste handling and high costs. Furthermore, concerns have not been reduced due to the recent Fukushima accident (Karakosta *et al*., 2013). Several countries are currently facing the question of whether or not to rebuild their nuclear power stations in the next few decades, while policy makers are consulting the public regarding its opinion of nuclear power (Visschers *et al*., 2011). Based on literature, the technology itself seems to have a negative image, which is an issue to solve for companies developing nuclear projects.

There is an increasing need for studies to better understand the dynamics of the media sentiment, including also SoMe, which can be used for analysing public attitudes with the help of opinion mining, based on artificial learning machine media monitoring systems, by a company's MI function. Compared to traditional news media, which can shape public opinion regarding an issue by emphasising some elements of the broader controversy over others (Shah, Watts, Domke & Fan, 2002), SoMe presents more direct opinions, often including emotional content (Stieglitz and Dang-Xuan, 2013). This study analyses the global media sentiment of nuclear power from both editorial and social media by using the M-Adaptive tool for media monitoring, thus comparing the differences at company level. This research aims to fill the gap related to technology sentiment impact at a strategic level of the company with related research method development, namely based on big data utilization with computational linguistics and machine learning, to discover the sentiments from large data sets.

2. LITERATURE REVIEW

The general public is a stakeholder, although this can be overlooked in stakeholder

management (Mitchell *et al*., 1997). Although nuclear power and renewable power are considered to be the main existing technology options for near zero emission power production, their main difference is sustainability and acceptability. Renewable power is considered to be sustainable, nuclear is not, and the public acceptance of nuclear power is also rather low (Verbruggen., 2008). There are indications that people's acceptance of nuclear power may be influenced by the available alternatives, and previous nuclear accidents have increased the public's opposition towards nuclear power (Siegrist *et al*., 2013). When comparing people's perception of nuclear power to climate change, it shows that if people are presented with the benefit of nuclear power to mitigate climate change and are asked to choose between nuclear power stations or climate change, cautious preference or "reluctant acceptance" to nuclear power stations and related waste may arise over the consequences of climate change (Pidgeon *et al*., 2008). However, the increase in adoption of renewable power systems can be considered as a decreasing factor for this when providing alternatives. There have been studies examining the willingness to take actions against or in favor of nuclear power stations, with logical implication that the perception of nuclear risks seems to reduce the public's acceptance or their preference for nuclear power (Tanaka, 2004). This has also increased people's willingness for opposition (de Groot and Steg, 2010), whereas more perceived benefits increased the acceptance of nuclear power (Tanaka, 2004).

The recent Fukushima Daiichi nuclear power plant accident in Japan on March 11, 2011 influenced the acceptance of nuclear power globally (Siegrist *et al*., 2013). Research about the Chernobyl accident in the eighties shows that such accidents may influence the formation of more negative attitudes towards nuclear power (Eiser *et al*., 1990; Verplanken, 1989). For example, in Germany, attempts to locate a permanent nuclear waste repository and "the resistance of the German people towards nuclear weapons and atomic energy" provoked an aggressive anti-nuclear movement. The movement's influence particularly heightened after the Chernobyl accident, especially in Southern Germany and Bavaria which were affected by the fallout (Sovacool *et al*., 2012). The more recent Fukushima accident also had a clearly negative impact on the acceptance of nuclear power, however the mean change was considered moderate and was strongly influenced by participants' pre-Fukushima attitudes (Siegrist *et al.,* 2013). In general, media reporting about nuclear accidents does not increase knowledge and understanding of radiation risks, but rather increases negative feelings and risk perception (Perko *et al*., 2012).

According to Keller *et al.* (2012), particularly affective images seem to affect people's acceptance of nuclear power. Therefore, people who earlier may have opposed the replacement of nuclear power plants may change their opinion when associating nuclear power with images such as radioactivity, nuclear accidents, risks and negative consequences for health and the environment, or even nuclear war (Siegrist *et al*., 2013). There are studies showing that those people who trust authoritative institutions such as the government are usually more supportive for nuclear technologies. It is shown that renewable technologies may not be as liked as nuclear technologies are disliked (Sovacool, *et al*., 2012). The concepts of risk and dread can be more often expressed reasonably by people who are opposing the replacement of nuclear power plants than by those who are in favour (Siegrist *et al.,* 2013).

Different content analysis methods can be considered to study a technology image, such as media framing (Teräväinen *et al*., 2011). However, these were not applied in this study. Previously, media frames were used together with cluster analysis and automated sentiment classification by Bursher *et al*, 2015. Also, few studies compare people's acceptance of nuclear power to that of other energy sources (Ansolabehere and Konisky, 2009). From this, it seems that people who supported the replacement of nuclear power often associated nuclear power plants with neutral and positive concepts such as energy, and to a smaller extent, with necessity (Siegrist *et al*., 2013).

Furthermore, many discursive strategies can be considered when communicating nuclear power technologies, such as necessitation, naturalisation, scientification and rationalisation (Teräväinen *et al*., 2011). This study introduces a new method for both editorial and SoMe analysis: an opinion mining approach based on a machine leaning media-analysis to provide a wider view.

3. RESEARCH METHODS

The research methodology in this paper is based on a literature study accompanied by opinion mining based on media sentiment analysis including a vast number of editorial and social media sources, with a lexicon-based approach. Thus, the basic research principles have been formerly used in different fields of studies, for example in competitor and market intelligence studies. In this study, however, the application of framing and cluster analysis was considered to be non-applicable, in addition to statistical methods. This is due to a comparison of editorial content with SoMe, and to the fact that media frame comparability between two different types of communication is challenging. Furthermore, it was also challenging to find suitable statistical method for data-series analysis.

The main reasons for choosing this method was applicability to large global datasets, both from editorial content and SoMe, fast data processing and reduced risk of bias caused by human perceptions and interpretations (Matthes & Kohring, 2008). The data for this study is taken for one year, included in the period was a major international climate conference, Paris COP21.

The users of the social web have a new role as data providers, as it seems to provide an excellent platform for analysing public attitudes (Penalver-Martinez *et al.,* 2014). By adopting this type of approach and a particular tool, the amount of analysed datapoints is drastically increased compared to questionnaires and interviews, or traditional media-analyses. Despite the IPR-protected algorithm, which is not visible, the method is not entirely a black box, it is rather a grey box. For this reason, software was tested in a master's thesis (Nuortimo, 2015) comparing it to traditional media analysis methods and the logic of how the sentiment is calculated is known, as sentiment is mathematically calculated as a sum from local document sentiments. Futher, software is learned by humans for better accuracy. In computational linguistics, due to the complexity of the algorithms, they are usually evaluated on the basis of testing and comparison, as was done by Chen, 2018.

The data was analyzed to obtain a clear view of nuclear power technology sentiment and to discuss further implications to companies. Hence, the research setting in this article is the media-sentiment analysis, where media sentiment is analysed to discover possible implications to public acceptance. As a result, we attempt to clarify the link to technology market deployment and corporate decisions.

This method is based on commercial software in order to discover the sentiment relating to nuclear power, similar to the method applied by Burscher *et al,* 2015. Opinion mining is a research field, which consists of natural language processing, computational linguistics and text analysis technologies, in order to get various informational and added-value elements from users' opinions (Penalver-Martinez *et al.,* 2014).

The approach used in this paper, where an algorithm calculates the global document sentiment based on the quantity of local sentiments, seems to be a valid approach despite known errors (app. 20% of classifications). Furthermore, human analysis of text information is subject to considerable biases, such as emphasising the importance of opinions matching with their own preferences (Liu *et al.,* 2012).

In this paper, the media sentiment of nuclear power both in editorial and SoMe is studied. The M-Adaptive software is used, which includes 3 million SoMe platforms and 100,000 news outlets. The sentiment is analysed as a combination of computational linguistics and human aided machine learning (M-Brain). The method is a more quantitative type of analysis compared to traditional qualitative methods such as surveys. In the software, the keywords "nuclear power" were used as input. The analysis was made over one year 2.7.2015-2.7-2016, and included a total of 41,591 data points from both editorial publications (14,482) and SoMe sources (27,109). The study can be replicated by typing the same search words into the M-Adaptive software.

The sentiment expressions in the text are recognised and then classified automatically by type:positive, negative, neutral, mixed or unknown. M-Brain has made some internal tests, which indicate app. 80 % accuracy in sentiment classification. The error occurs in case of any given individual document, due to inherent ambiguity in natural language. It is also known that humans do not agree 100% in similar cases. As a limitation, the system does not recognise humour or sarcasm. However, in large data sets, the overall model matches human judgement on the same data qualitatively.

4. MEDIA SENTIMENT OF NUCLEAR POWER TECHNOLOGY

In the machine-based analysis, the large amount of data points gained from media hits provides a good basis for analysing the media sentiment, especially in terms of regular people on SoMe. In Figure 1, the sentiments towards nuclear power are described both from editorial publications, and SoMe.

The results indicate that nuclear power is linked to negative hits both in editorial publications (8,976) and SoMe (11,458). There were 3,737 positive hits in the editorial content and 5,183 in SoMe, which is fairly low compared to the total hits. The neutral hits accounted for 726 in the editorial content and 9,899 in SoMe. Mixed hits accounted for 1,043 hits in the editorial content and 569 hits in SoMe. This seems to indicate that the press has adopted a negative tone towards nuclear power during the time period in question.

Figure 2 describes the 62% of negative hits in editorial content. Only 26% of hits in editorial publications were positive, indicating a relatively low technology acceptance among journalists, and also an absence of the journalistic type of discussion and rhetoric which would include multiple views. The amount of mixed (7%) and neutral (5%) hits is quite small.

Figure 3 describes the public sentiment towards nuclear power in SoMe as negative (42%). This was somewhat different compared to editorial publications, with a slightly less negative share. Figure 3 indicates that public sentiment toward nuclear power in SoMe is also more neutral (37%) with a 32% difference compared to editorial publications. This can be seen as an indication that the press has adopted more negative discourse than individuals on SoMe.

Figure 4 indicates that Twitter provided the most SoMe data, with almost eighteen thousand hits. These were mostly neutral (9,231) or negative (5,425), with fewer positive (3,185) and mixed (44) hits. This can be observed as a negative data concentration. Blogs had 4,288 negative hits, 1,253 positive, 411 mixed and 226 neutral. In comparison with Tumblr (238), Google Plus (1,345), Facebook (471) YouTube (404), VKontakte (45), Instagram (109) and Forums (434), Twitter (17,885) was the most influential SoMe source.

Figure 5 shows that media sentiment has followed roughly new nuclear building in the selected countries. Finland is building the Olkiluoto 3 unit and also the Hanhikivi plant

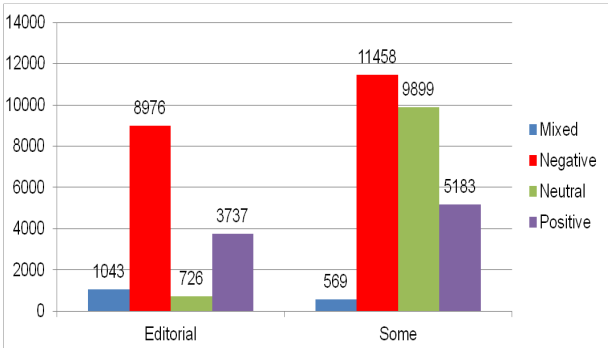

Figure 1 Sentiment analysis of nuclear power in SoMe vs. editorial publication.

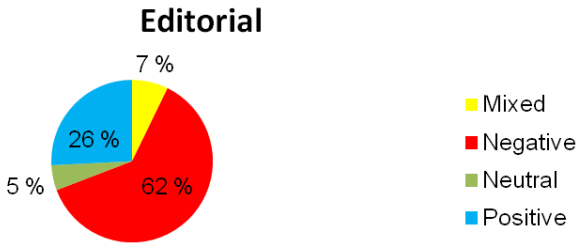

Figure 2 Sentiment analysis of nuclear power in editorial publications.

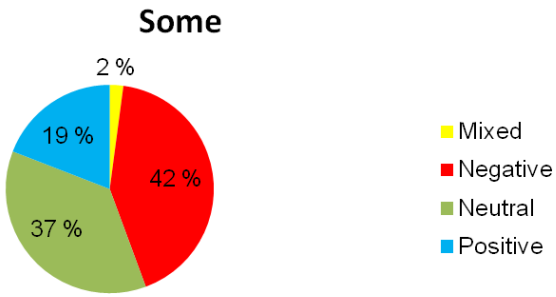

Figure 3 Sentiment about nuclear power in Social Media.

by Fennovoima (subject to building permits), and the country clearly has less negative sentiments both in editorial content and in SoMe. Japan, after the Fukushima accident, experienced more negative attitudes. France, China and Russia are all major countries with nuclear capacities. They fall in the middle of the spectrum. Britain, now with Hinkley Point considerations, interestingly has a more negative tone compared to Germany, which has a significant nuclear decommissioning program and large renewables capacity. It may be an indication that the supply security issue might rise in importance. India has the largest difference between opinions from editorial content and SoMe, where sentiment in SoMe is interestingly 23% less negative.

Figure 6 illustrates the effect of the global Paris COP climate negotiations on the nuclear power media image in editorial publications

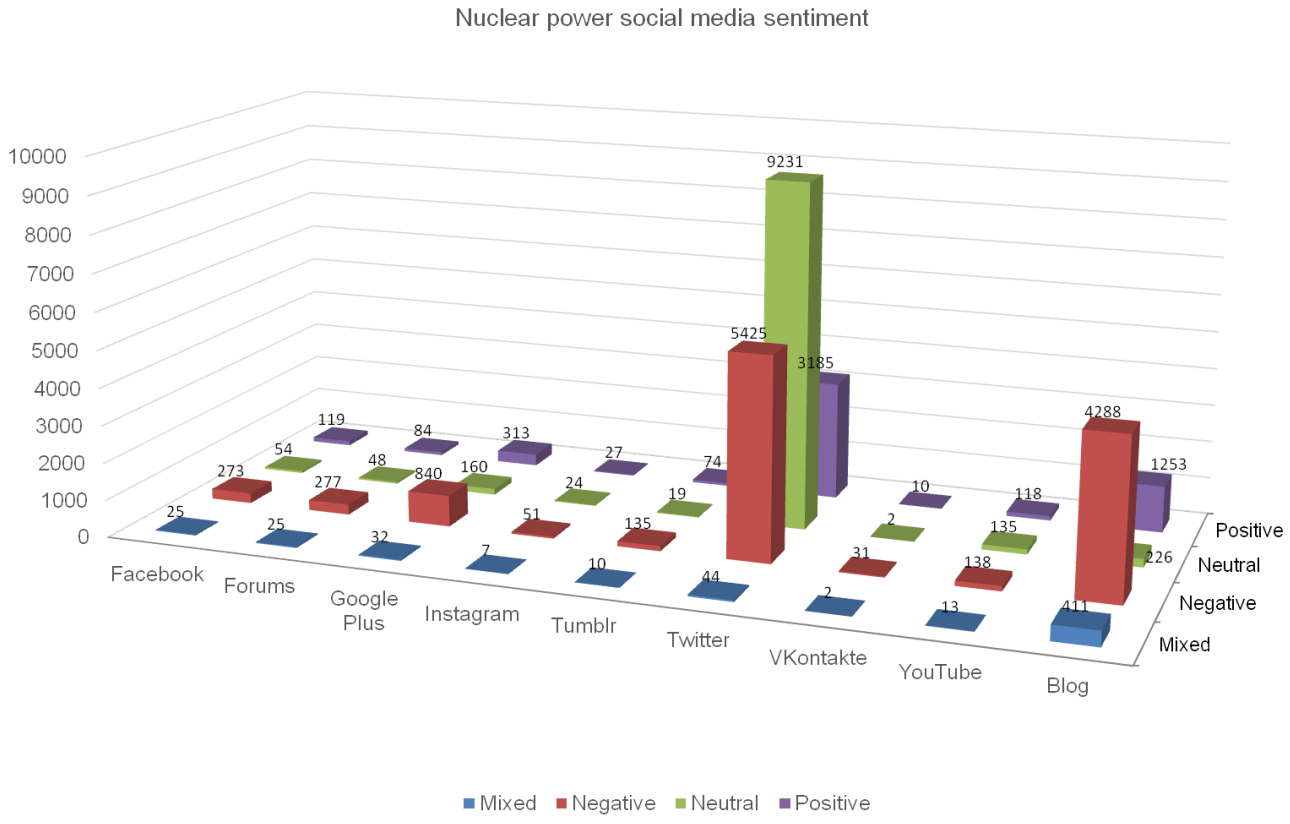

Figure 4 Deviation of social media sentiment analysed by media type.

and in SoMe. The preliminary conclusion that can be drawn from this entails that nuclear power technology is not seen as a solution that is considered for addressing climate change, and thus media-attention towards nuclear power technologies is mostly negative.

From the general data analysis it is visible that public sentiment towards nuclear power in both SoMe and editorial publications was mostly negative, similar to the results of the literature review.

However, when moving from a global level to country level, there exists some variations in media sentiment, depending on each country's political situation and also new nuclear building in the country. Two countries with ongoing nuclear developments, namely Finland and UK, were selected. On a country level, Finland clearly had the lowest negative editorial media sentiment of the selected countries, and also the second lowest percentage in SoMe after Germany. This

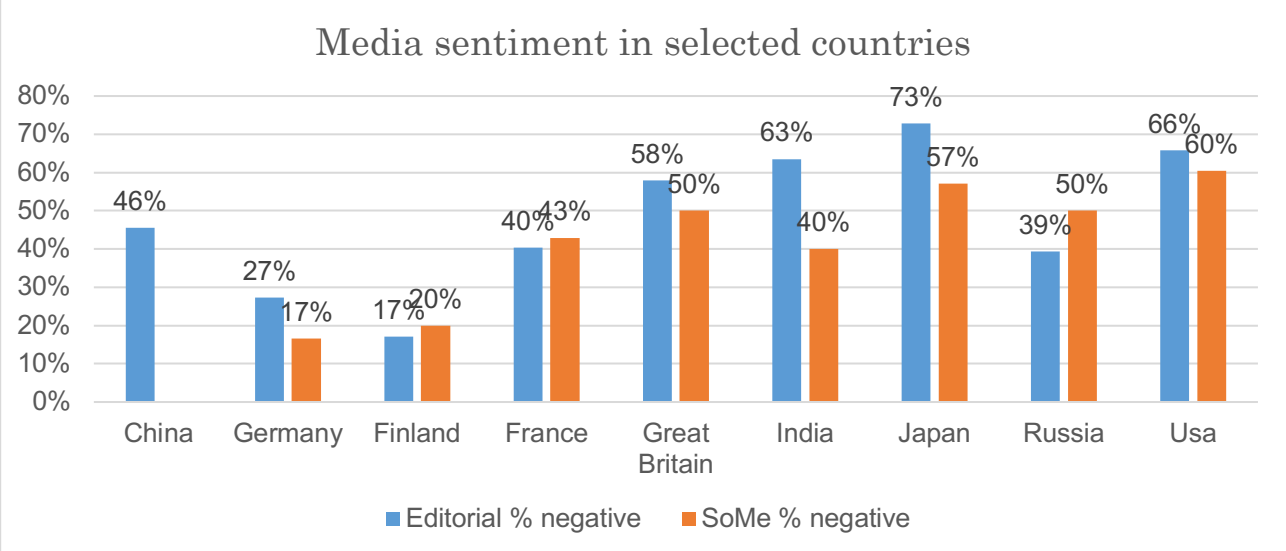

Figure 5 Media sentiment on nuclear power in selected countries.

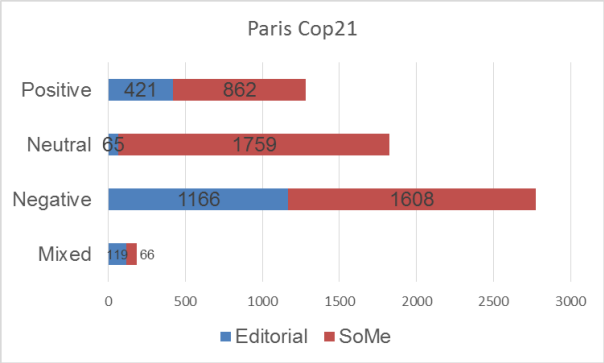

Figure 7 Media emphasis on nuclear power during the global Paris COP climate negotiations.

indicates a more positive tone towards nuclear power in Finland.

Project media sentiment over a half year (1.12.2016-25.5.2017) was observed in the case of two projects, namely Fennovoima in Finland and Hinkley Point C in the UK, both of which are in early construction phases of development. Figure 7 illustrates the sentiments towards Fennovoima, a project company established to build a Hanhikivi nuclear reactor in Finland.

From Figure 8 it is visible that Fennovoima has attracted mostly neutral and also positive attention both in editorial content and in SoMe. This indicates the general positive attitude in Finland, visible in the country analysis, and may indicate also the presence of PR-activities by the company.

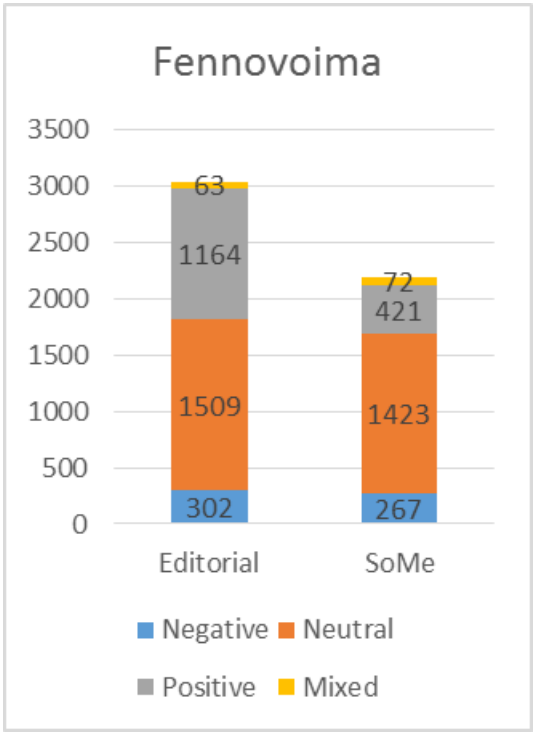

Figure 6 Media sentiment towards Fennovoima.

When looking more closely to the media source in the case of Fennovoima it can be observed that the mostly positive editorial media attention has had some response from Twitter, which is more negative, possibly indicating the presence of local opposition groups. Compared to the editorial media, which is clearly more positive, this indicates

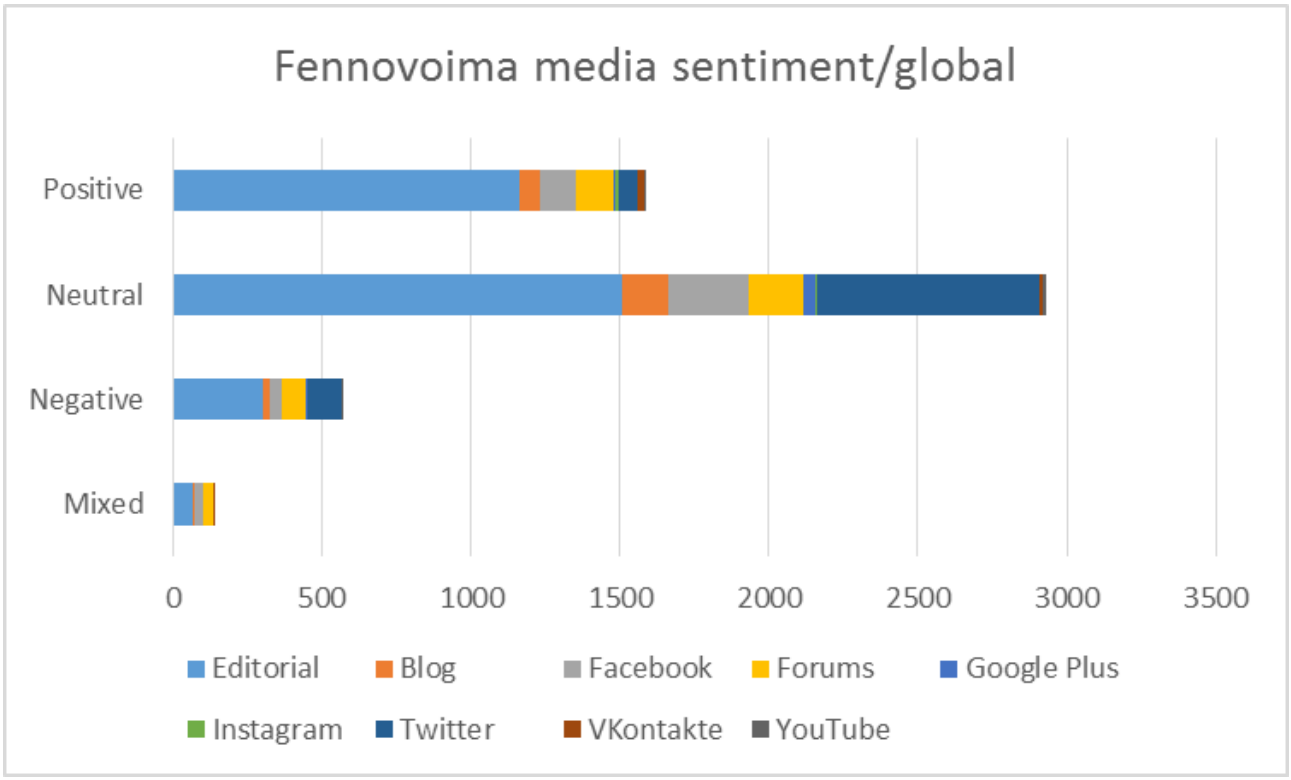

Figure 8 Media sentiment towards Fennovoima/by source.

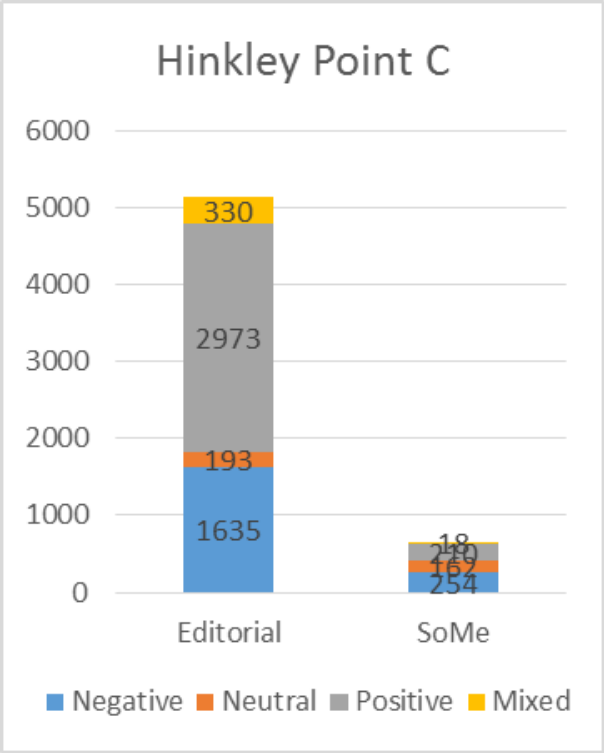

Figure 9 Media sentiment in Hinkley Point C.

that SoMe channels can be used as means for communicating local opposition in the case of large onshore projects.

The media attention for the Hinkley Point C project in the UK (Figure 9) seems to follow the general consensus of the country with its more negative attitude. However opinion towards nuclear power is still mainly positive in the editorial media, but mostly negative in SoMe with app. ten times less hits than in editorial media.

Figure 9 describes the sentiment towards Hinkley Point C according to editorial media and SoMe, with an clear indication that the editorial media emphasized both positive and negative communication. The general sentiment is positive. However, the percentage of negative sentiments is slightly higher in SoMe (Figure 10).

When summarizing the media sentiment of nuclear power (Figure 11), it can be observed that although globally the sentiment in the editorial media (62%) and in SoMe (42%) is negative, there are differences on a country level. For example, countries with less negative sentiments compared to the global average, such as Finland and the UK, also have active nuclear projects in the country, and those projects also have a less negative media image than nuclear power does on the country level. There is slightly higher percentage share of negative SoMe sentiment for a single project. However, on a project level, the media attention is less negative both in the editorial media and in SoMe than at the global and country level, possibly indicating that with positive project investment decision, there is supporting communication from the project company. For these countries with nuclear

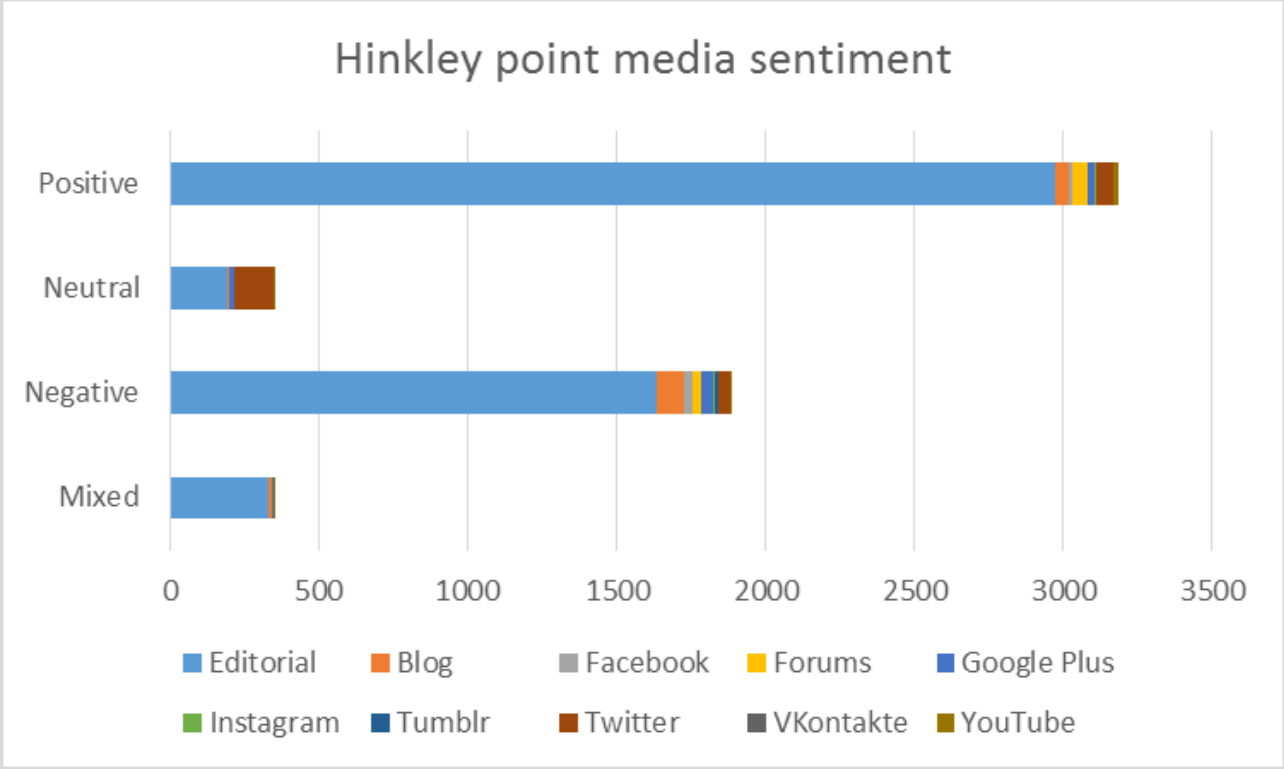

Figure 10 Media sentiment towards Hinkley Point C, Editorial/SoMe.

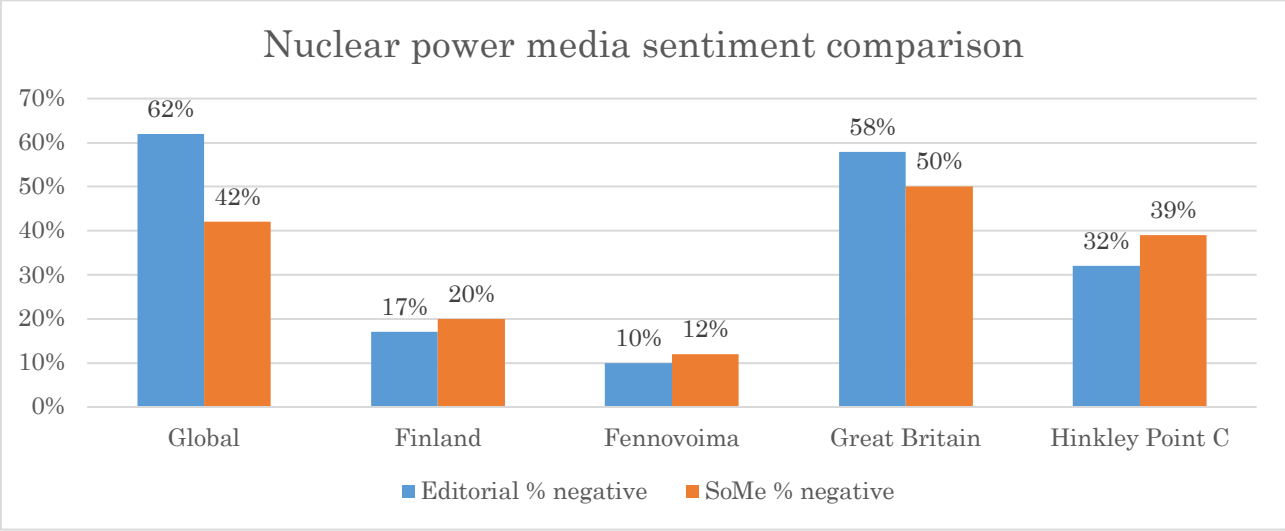

Figure 11 The comparison of nuclear power negative sentiments at global, country and project levels.

capacity, it is not comparable to country sentiment.

Figure 11 shows that globally the sentiment about nuclear power in the editorial media (62%) and in SoMe(42%) is clearly negative, there exist differences on country and project level. Finland and the UK have less negative sentiments compared to the global average, and nuclear projects also have a less negative media image than nuclear power on the country level. Thus there is slightly larger percentage share of negative SoMe sentiment for single projects (Finland/Fennovoima (2%) and UK/Hinkley Point C (7%)). On a nuclear project level, the attention is less negative both in editorial media and in SoMe than at the global and country level.

5. DISCUSSION

The global media-analysis was conducted by utilising a key-word based search and M-adaptive media monitoring software. The analysis was made over one year, 2.7.2015-2.7-2016, and included a total of 41,591 data points from both editorial publications (14,482) and social media sources (27,109). Media sentiment of nuclear power was neutral and negative in editorial content and in SoMe, where SoMe sources included more neutral attitudes. Active discussions concerning nuclear power have taken place for example on Twitter, with almost eighteen thousand mostly neutral and negative hits, emphasising the importance of short communication via social media. The analysis points out that the general publics' opinion can be an important factor for technology acceptance and a company's brand image. Good examples of this correlation include Finland's positive attitudes and new building projects, and Japan's negative media sentiment as a response to the recent nuclear accident and nuclear decommissioning program. When considering the effect of relevant international events such as the Paris COP 21, the media attention is increased during the event. In this case the attitude shift towards nuclear power was mostly negative.

The main benefits of the results lie in figuring out global trends and technology development directions by using a larger data set than previous studies, and fast analysis of possible changes influencing decisions on a corporate level. The role of SoMe is continuously increasing and it presents a challenge for technology developers and corporate strategists. It seems that a negative link between media sentiment of technology to technology market deployment exists in the case of nuclear power, needing actions on the company and project levels, such as communication, branding and PR.

The main contribution of this study lies in incorporating a method of competitor/market intelligence functions to study the media sentiment of nuclear power, therefore bringing a new angle to corporate decisions. This is a new type of approach compared to earlier questionnaire, or interview-based studies with moderate datasets of hundreds of data points that are used in most similar studies, e.g Heras-Saizarbitoria *et al.*, (2011). This method has positives and negatives when compared to qualitative studies. However, in the future this type of method could be used as a basis for both longitudinal data-series analyses, and also for SoMe firestorm detection.

The ability of the software does set some limitations on the extent of possible time periods to be analysed, yet still allows for

analysis of extensive data sets. The sentiment analysis indicates that large emotional bursts relate to SoMe firestorms, thus sentiment is calculated and the number of negative bursts is clearly visible in the data-series trend analysis. This study agrees with Stieglitz and Dang-Xua's (2013) view, that emotionally charged social media messages are repeated more often and quickly than neutral ones. This view could be used as a basis for an automated social media firestorm detector, in which the application would give signals if there are signs of large negative sentiment rising in SoMe together with escalation in speed estimates and a corporate action plan.

Managers can benefit from the possibility of analysing global attitudes and their changes, for example for their companies or projects, highlighting the needs for public engagement and the urgency of SoMe participation.

In this study, there are the following limitations:

1) The results are dependent on the keywords used.
2) Content analysis methods, such as framing and cluster analysis, were not applied.
3) Statistical methods were not applied. Although statistical techniques are applied by communication scholars in order to identify news frames, it is not possible to do this in a conceptually valid manner (Carragee & Roefs, 2004). This also brings challenge for further research.
4) No detailed content analysis was possible due to a very large dataset, leaving the classification errors depending mostly on accuracy provided by the software supplier.

6. CONCLUSIONS

This study shows how a company's MI function can be utilized in defining product technology sentiment, which in the case of nuclear power technology has a neutral and negative public sentiment. This is further emphasised during large national climate congresses such as the Paris COP21. Companies deploying nuclear power projects suffer from a negative media sentiment, which is clearly visible via social media. This is in contrast to renewable power technologies (Nuortimo, 2018). Factors that favour nuclear power market deployment include its availability and CO_2-emissions.

The media-analysis indicates that on a global level sentiment towards nuclear power is negative, but in the case of individual projects there is a more positive sentiment, probably due to the project company's communications and branding efforts. SoMe especially has a role in influencing nuclear power technology's media sentiment, which can be considered when planning marketing and PR for a single company. Thus, when facing negative sentiment towards the company's main technology, there seems to be constant need for a positive brand messaging. This paper also indicates the need for cooperation between a company's MI function and marketing, in order to detect and counteract possible firestorms arising from SoMe.

The link from technology's media sentiment at the corporate level exists in the case of nuclear power, with implications to managerial decisions. How can a company monitor media efficiently and distribute this information between different functions? What is the result, does the general public like the technology, and if not, what can be done with this information? A company could divest the technology or increase PR-activities, among other actions. The implications for company strategy also include the emphasis on product portfolio management and co-operation between different functions, including MI, technology management and marketing/PR. This view includes taking advantage of digitalization to refine the product portfolio of the company and better link to the MI function, thus the company's product strategy is refined to better account for changes in the external market environment, and to highlight the need for supporting PR, communications and public engagement activities.

Our main finding is that the technology related sentiment of a company's products may impact corporations on a strategic level, and media monitoring systems from a company's market intelligence function based on big data utilization with computational linquistics and machine learning can be utilized to detect this. Further research for deeper data-analysis could have interesting results. Company-wide implications and co-operation between functions, such as strategic planning, market intelligence, communications and marketing, could be an extensive area for further research. Finally, algorithms cannot entirely replace human intelligence yet, however, they do provide significant advantages in quantity and objectivity to aid in various tasks.

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