Performing Causal Configurations in e-Tourism: a Fuzzy-Set Approach

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"Fuzzy-set analysis works from the assumption that the life isn't black and white. Things can be more black, or more white, but rarely are they all one or the other"
Sophia Greeley, ImpactReady Consulting Fellow 2013

Search engines are constantly endeavouring to integrate social media mentions in the website ranking process. Search Engine Optimization (SEO) principles can be used to impact website ranking, considering various social media channels' capability to drive traffic. Both practitioners and researchers has focused on the impact of social media on SEO, but paid little attention to the influences of social media interactions on organic search results. This study explores the causal configurations between social mention variables (strength, sentiment, passion, reach) and the rankings of nine websites dedicated to hotel booking (according to organic search results). The social mention variables embedded into the conceptual model were provided by the real-time social media search and analysis tool (www.socialmention.com), while the rankings websites dedicated to hotel booking were determined after a targeted search on Google. The study employs fuzzy-set qualitative comparative analysis (fsQCA) and the results reveal that social mention variables has complex links with the rankings of the hotel booking websites included into the sample, according to Quine-McCluskey algorithm solution. The findings extend the body of knowledge related to the impact of social media mentions on rankings and have relevant practical implications on SEO development.

Keywords: fuzzy-sets, Qualitative Comparative Analysis, e-tourism, social mention, hotel booking
JEL Code: L83, L86, C87

1. Impact of social media on SEO: Theoretical background

Despite the fact research into social media is still at an early stage (Michaelidou, Theofania Siamagka & Christodoulides, 2011), existing research in the field provide evidence that social media (like Facebook, Twitter, MySpace, LinkedIn, etc) are very popular and are used as communication and marketing tools to achieve brand objectives because of the number of active members they attract (Facebook for instance has more than 800 million fans), because of their interactive feature that contributes to foster relationship with customers and also because of their ability to boost brands popularity (Kim & Ko, 2012; Vries, Gensler & Leeflang, 2012; Michaelidou et al, 2011). Firms are now keen to make profitable use of the social media (Kaplan & Haenlin, 2012) even if they do not always know how to use them effectively and also how to measure their effectiveness (Hanna, Rohm & Crittenden, 2011). Social media are also very popular with consumers as they offer a platform where

they can share their product experiences and opinions but also evaluate the products they bought (Chen, Fay & Wang, 2011). Consumers are no longer passive. Their active role is increasing, as a result of this, they are considered as co-creators of marketing content with firms (Hanna, Rohm & Crittenden, 2011). This form of communication known as electronic word-of-mouth (eWOM) affects consumer attitudes on a wide range of products and services (Lee, Park & Han, 2008). The same way social media can be excellent marketing tools to facilitate interactions; collaborations and sharing content customers, social media can also have negative impacts on a brand's reputation (Kim & Ko, 2012).

That said research on social media or mainly focuses on: drivers that influence number of likes and comments (Vries et al, 2012); consumer posting behaviour (Chen et al, 2011); effects of negative eWOM communication on consumer attitudes (Lee et al, 2008); effective use to achieve brand objectives (Kim & Ko, 2012; Michaelidou et al, 2011; Hanna, Rohm & Crittenden, 2011; Kaplan & Haenlin, 2010) and method of measure of performance (Hanna, Rohm & Crittenden, 2011). This absence of research into the impact of social media on Search Engine Optimisation (SEO) provides the impetus for our study which addresses this gap and contributes existing literature. Al-Badi, Al-Majeeni, Mayhew & Al-Rashdi (2011) consider the impact of social media as a secondary factor in website ranking. As a matter of fact, social media is not even included in their top 10 factors namely (Al-Badi et al, 2011: 5):

- Keyword use in title tag
- Anchor text of inbound links
- Keyword use in document text
- Accessibility of document
- Link to document from site-internal pages
- Primary subject matter of site
- External links to linking pages
- Link to popularity of site in tropical community
- Global link popularity of site
- Keyword spamming.

Social Media, Classifications and Metrics

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The 'social media' phenomenon has arguably revolutionized the ways people interact with each other and how firms interact with their clients. It has attracted much attention from industry and academic researchers who are intent on exploring the potential benefits and reach. From a practical perspective, there is significant drive by firms to adopt social media channels as part of their marketing strategy. This is part of an emerging strategy, often referred to as integrated marketing is driven by the belief that social media is where current and prospective customers are to be found. Globally firms of all sizes are heavily investing to adopt social media for various purposes including customer engagement, CRM and direct sales (Woodcock, Green and Starkey, 2011). In this evolving context, there is also consensus that metrics are deemed necessary for the development and evaluation of improved understanding that can lead to improvements in integrated marketing communications strategies (Hutton, 1996; Barger, 2013).

Nevertheless, there is currently intense ongoing debate in regards to how to define it exactly and what aspects to measure and how best to maximise ROI. The fact that currently there is no one agreed approach as to how to delimit what social media is or is not makes the latter difficult to understand. This can be explained by the fact that there is difficulty in drawing a distinction as well as interplay between the technology platforms that enable social interactions in cyber space and the social interactions themselves which are often highly complex (Kaplan 2008, Kaplan & Haenlein, 2010).

Various ways of classifying social media have been proposed (Ngai, Tao, Moon (2015). This paper focuses exclusively on so-called 'social networking' sites, a category that has come to be accepted across a wide number of these attempts to taxonomise the social media phenomenon.

2. Research methodology

Qualitative Comparative Analysis (QCA) is a method that bridges qualitative and quantitative analysis (Rihoux and Ragin, 2009), allowing the assessment of multiple causal configurations, which implies that (1) most often, it is a combination of conditions that generate an outcome; (2) several different combinations of conditions may produce the same outcome; (3) a given condition may have a

different impact on the outcome depending on the context (Ragin, 2014). QCA is considered the appropriate method when researchers are involved in modelling asymmetric relationships and reporting conditions that are sufficient (but not necessary) to cause an outcome condition. Using measures of consistency (analogous to a correlation) and coverage (a measure of effect size), QCA provides estimates of how alternative conjunctive models explain a certain behavior (Woodside, 2010). Set-theoretic methods such as fuzzy-set QCA (fs-QCA) are uniquely suitable for testing typological and configurational theory because they explicitly conceptualize cases as combinations of attributes and emphasize that the case combinations give them their uniqueness (Fiss, 2011).

This study uses the ranking of nine hotel booking websites, according to organic search results, as the **outcome** (Table 1 - Appendix).

The second step consists of identifying the **causal conditions** relevant to the outcome. Thus, the various combinations of conditions that might generate the outcome outline the effects of social mention variables on the ranking of the nine hotel booking websites, considered relevant cases in the research sample.

The social mention variables ***(***according to www.socialmention.com***)*** are the following: **strength** (the likelihood that a brand is being discussed in social media); **sentiment** (the ratio of mentions that are generally positive to those that are generally negative); **passion** (a measure of the likelihood that individuals talking about a brand will do so repeatedly) and **reach** (a measure of the range of influence, determined as a number of unique authors referencing a brand divided by the total number of mentions). These social mention variables represent the antecedent conditions in the research framework.

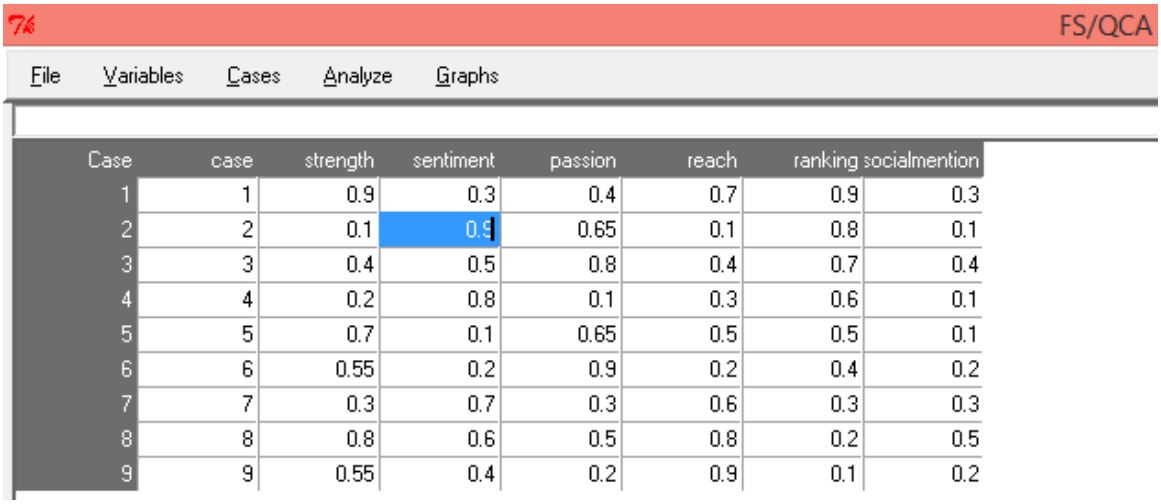
The **research model** can be outlined as it follows: the websites' ranking represents a function, whose arguments are strength, sentiment, passion, reach:

Ranking = f (strength, sentiment, passion, reach)

Calibration of variables into conditions (equivalent to independent variables in descriptive statistics techniques) and outcome (equivalent to dependent variable in descriptive statistics techniques) is a critical step in fsQCA analysis, because it provides the final fuzzy set scores for all of them. In our particular case, we assigned the fuzzy set values 0.9 and 0.8 to the membership: "mostly but not fully in"; 0.7 and 0.6 to the membership: "more or less in"; 0.5 to the membership "cross-over: neither in nor out"; 0.4 and 0.3 to the membership "more or less out"; 0.2 and 0.1 to the membership: "mostly but not fully out" (Table 1 – Appendix).

Socialmention represents a target variable, determined by computing the fuzzy-set values of the input sets embedded into the conceptual model (strength, sentiment, passion, reach) (Figure 1). The membership rules were the same as the ranking, according to Tables 2,3,4 and 5 from Appendix.

socialmention = fuzzyand(strength, sentiment, passion, reach)


FS/QCA

File Variables Cases Analyze Graphs

Case	case	strength	sentiment	passion	reach	ranking	socialmention
1	1	0.9	0.3	0.4	0.7	0.9	0.3
2	2	0.1	0.9	0.65	0.1	0.8	0.1
3	3	0.4	0.5	0.8	0.4	0.7	0.4
4	4	0.2	0.8	0.1	0.3	0.6	0.1
5	5	0.7	0.1	0.65	0.5	0.5	0.1
6	6	0.55	0.2	0.9	0.2	0.4	0.2
7	7	0.3	0.7	0.3	0.6	0.3	0.3
8	8	0.8	0.6	0.5	0.8	0.2	0.5
9	9	0.55	0.4	0.2	0.9	0.1	0.2

Figure 1: Fuzzy-sets embedded into the research model
Source: print-screen from fsQCA software

Based on the data stored in fsQCA software database, two types of analyses will be addressed in the following section of the paper: a visual representation of cases on a fuzzy-set XY plot and the truth table analysis, which will finally lead to the result of the model.

3. Fuzzy-sets analysis

First analysis by means of fuzzy-set XY plot outlines the consistency and coverage scores. The lower right box shows the degree to which the data plotted are consistent with Y (ranking) ≤ X (socialmention computed variable) – equivalent with the assumption that Y is a subset of X. The upper left box shows the degree to which the data plotted are consistent with X ≤ Y (X is a subset of Y).

The results of the intermediate solution suggests that antecedent condition are sufficient for the outcome, due to the positioning of seven cases on the upper left quarter of the XY plot. Only two cases make the exception, being positioned on lower right quarter of the XY plot (Figure 2).

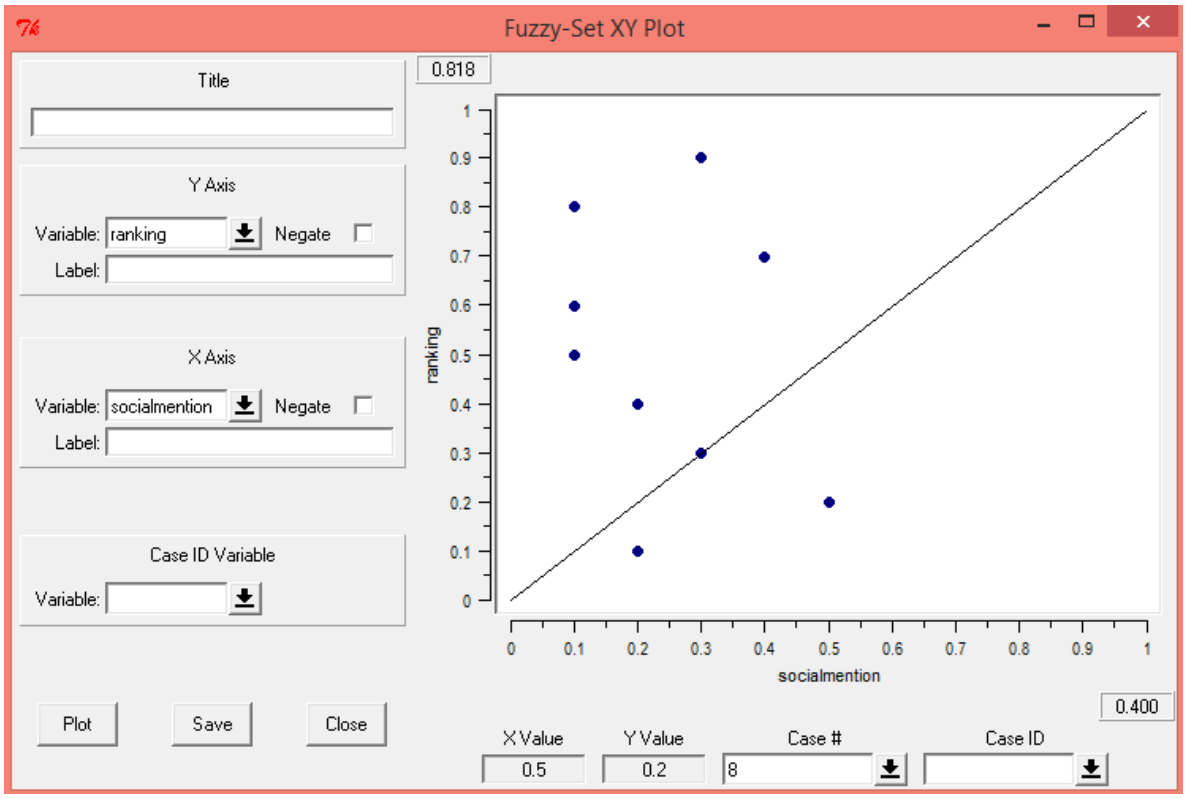
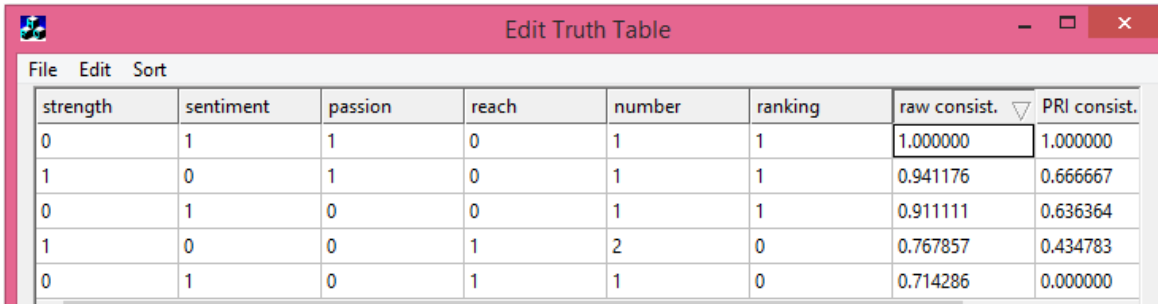


Figure 2: The distribution of the nine cases on a fuzzy-set XY plot graph (X – socialmention, considered target variable, while Y represents the outcome variable (ranking)

The value in the upper left corner is .818 (reflecting the consistency), while the value in the lower right corner is .400 (reflecting the coverage); these calculations indicate that the data are largely consistent with the argument that social mention computed variable is a subset of the outcome (ranking) and its coverage of ranking is 40%.

The truth table allows the examination of the kinds of cases that exist in a given set of data, listing all the different combinations of causally relevant conditions and treats each combination as a different kind of case (Ragin, 2008). The codification of cases in the truth table associated to this research model has deleted possible cases with no occurrences, and set the outcome value to 1 in three cases (Figure 3).



strength	sentiment	passion	reach	number	ranking	raw consist.	PRI consist.
0	1	1	0	1	1	1.000000	1.000000
1	0	1	0	1	1	0.941176	0.666667
0	1	0	0	1	1	0.911111	0.636364
1	0	0	1	2	0	0.767857	0.434783
0	1	0	1	1	0	0.714286	0.000000

Figure 3: The truth table related to the research model

The truth table lists all the logically-possible outcomes, while each case is considered as a configuration – a combination of the characteristics selected. This study produces instances of five configurations, as we can observe in Figure 3.

In order to find a complex solution, we have decided upon the level of consistency cut-off above 0.8, in which membership score on the outcome is consistently higher than the membership score of the causal configurations of social mention variables (strength, sentiment, passion and reach).

The truth table is used to interpret the solutions. The output table from the fsQCA software for the complex solution is shown in Figure 4.

```
 Algorithm: Quine-McCluskey
      True: 1

--- COMPLEX SOLUTION ---
frequency cutoff: 1.000000
consistency cutoff: 0.911111

                                    raw         unique
                                   coverage    coverage    consistency
                                  ----------  ----------  ----------
~strength*sentiment*~reach        0.644444    0.288889    0.906250
strength*~sentiment*passion*~reach 0.533333   0.177778    0.941176
solution coverage: 0.822222
solution consistency: 0.891566
```

Figure 4: The complex solution to the research model

The solution with the highest consistency (0.9411): strength*~sentiment *passion*~reach (where ~ indicates negation and* indicates logical AND) can be interpreted as follows: where there is a high level of strength and passion, combined with lower levels of sentiment and reach, there will be a successful recipe for a better ranking.

4. Conclusions, implications, limitations and further research

Social media interactions are crucial for achieving the highest ranking within organic targeted searches. The research reported in this paper is an attempt to represent causal configurations of social media mentions such that e-Tourism decision makers can understand their interactions from SEO point of view.

This study highlights the antecedent conditions that lead to the presence of the outcome condition: a better "ranking" for the hotel booking websites is not only the result of the SEO best practices, but also the result of social media mentions. In the particular case of hotel booking websites, if their administrators don't monitor their mentions in social networks, then they are missing out on valuable feedback and opportunities. Moreover, e-tourism operators' commitment to develop social media marketing strategies encourage communication and facilitate the sharing of useful information related to their brands.

The hotels' potential clients, looking for high quality and money value, have become more critically with regard to social mentions. In this context, the findings of this study help the e-tourism players to better understand the interactions between organic search results and social mentions.

The main limitation consists of the lack of "fully in" (1.00), respectively "fully out" (0.01) of the set. The further research will integrate two additional hotel booking websites, in order to assign the "fully in" and "fully out" memberships to the cases selected into the sample.

The next step is to improve the fuzzy-set QCA results robustness by adding new cases corresponding to "fully in" and "fully out" of the set. A longitudinal study is also envisaged to highlight the temporal evolution of complex fuzzy-sets like multi-dimensional conditions related to social mentions interactions, as well as their impact on organic results to targeted searches on hotel booking.

An excellent opportunity to present the further research results is the international conference "7th GIKA: Innovation, Knowledge, Judgment and Decision Making as Virtuos Cycles" that will be hosted by ISEG, University of Lisbon, Portugal in June 2017.

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Appendix

Table 1 - Hotel booking websites' ranking – according to organic search results

Case	Website	Ranking	Fuzzy-set value	Membership
1	www.booking.com	1	0.9	mostly but not fully in
2	www.hotels.com	2	0.8	
3	www.agoda.com	3	0.7	more or less in
4	www.trivago.com	4	0.6	
5	www.goibibo.com	5	0.5	cross-over: neither in nor out
6	www.makemytrip.com	6	0.4	more or less out
7	www.ebookers.com	7	0.3	
8	www.expedia.com	8	0.2	mostly but not fully out
9	www.travelocity.com	9	0.1	

Table 2 - Transforming strength percentage into fuzzy-set values

Case	Website	Strength percentage	Fuzzy-set value
1	www.booking.com	43%	0.9
2	www.hotels.com	3%	0.1
3	www.agoda.com	26%	0.4
4	www.trivago.com	4%	0.2
5	www.goibibo.com	38%	0.7
6	www.makemytrip.com	34%	0.55
7	www.ebookers.com	6%	0.3
8	www.expedia.com	41%	0.8
9	www.travelocity.com	34%	0.55

Table 3 - Transforming sentiment ratio into fuzzy-set values

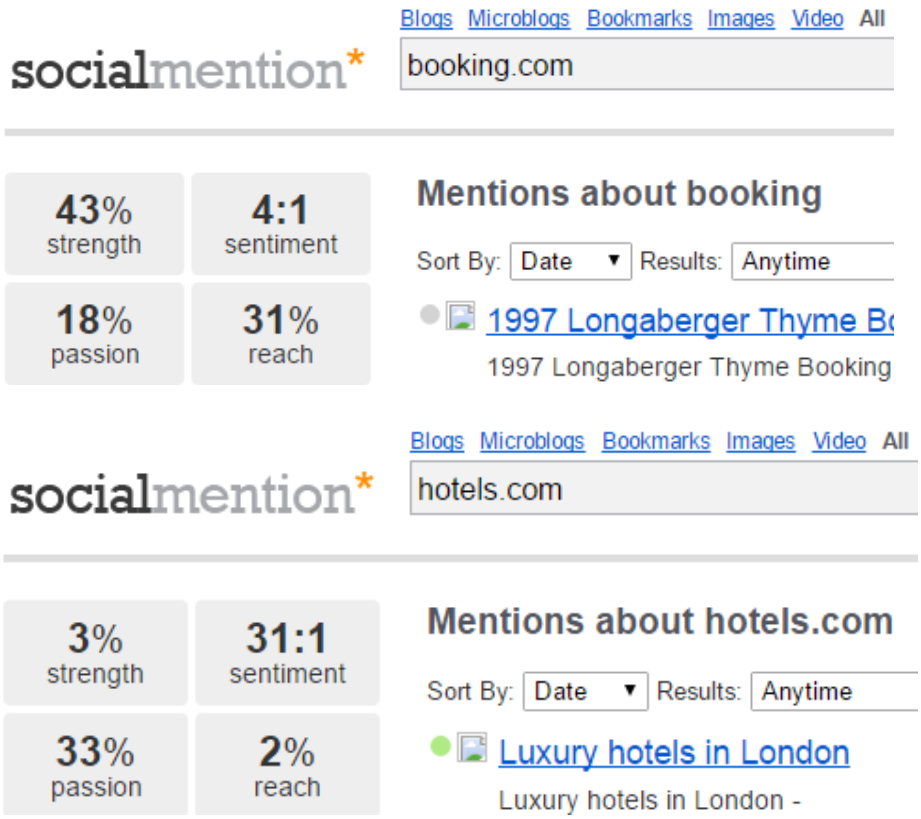
Case	Website	Sentiment ratio	Fuzzy-set value
1	www.booking.com	4:1	0.3
2	www.hotels.com	31:1	0.9
3	www.agoda.com	7:1	0.5
4	www.trivago.com	29:1	0.8
5	www.goibibo.com	2:1	0.1
6	www.makemytrip.com	3:1	0.2
7	www.ebookers.com	12:1	0.7
8	www.expedia.com	9:1	0.6
9	www.travelocity.com	6:1	0.4

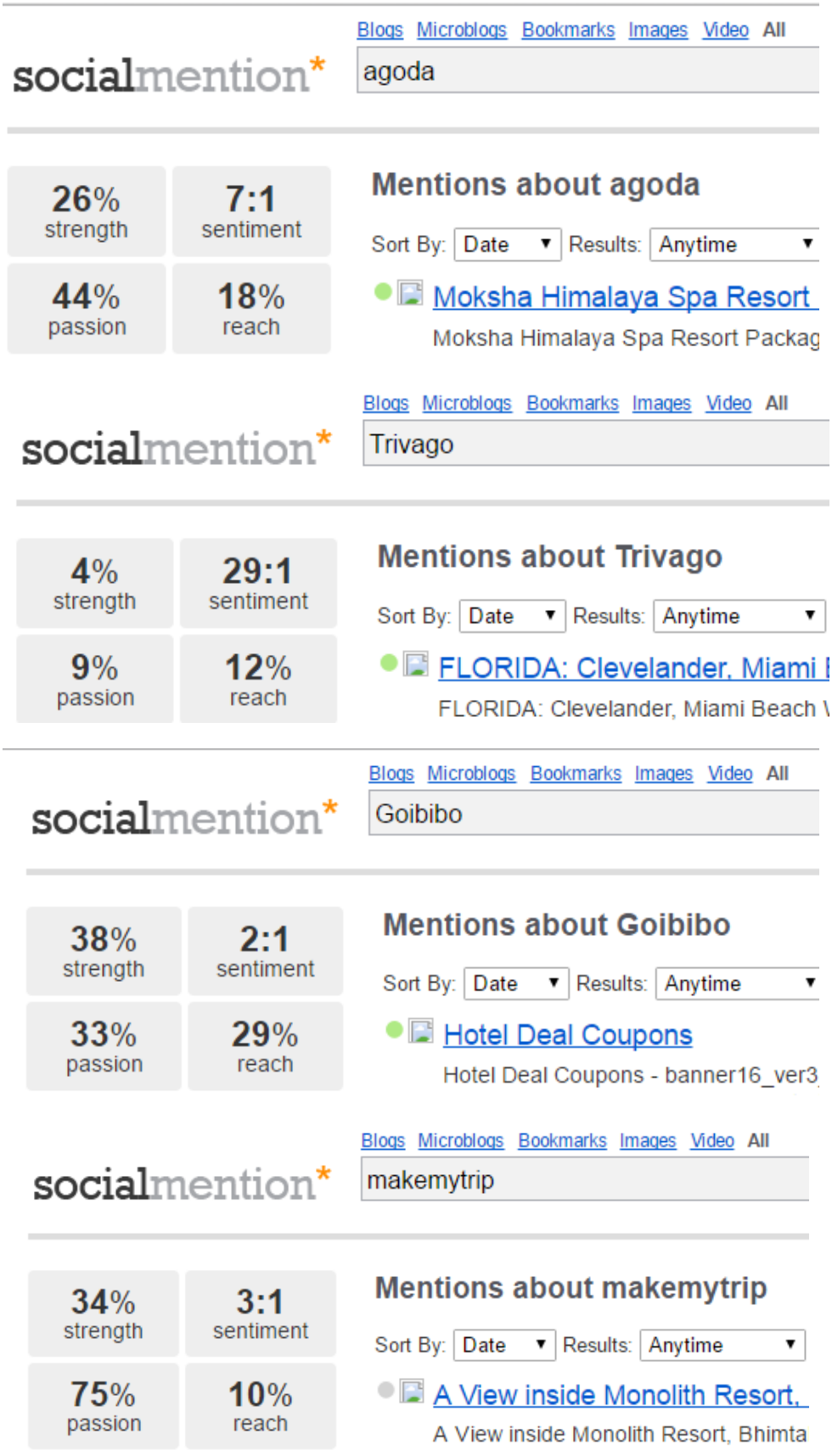
Table 4 - Transforming passion percentage into fuzzy-set values

Case	Website	Passion percentage	Fuzzy-set value
1	www.booking.com	18%	0.4
2	www.hotels.com	33%	0.65
3	www.agoda.com	44%	0.8
4	www.trivago.com	9%	0.1
5	www.goibibo.com	33%	0.65
6	www.makemytrip.com	75%	0.9
7	www.ebookers.com	16%	0.3
8	www.expedia.com	26%	0.5
9	www.travelocity.com	14%	0.2

Table 5 - Transforming reach percentage into fuzzy-set values

Case	Website	Reach percentage	Fuzzy-set value
1	www.booking.com	31%	0.7
2	www.hotels.com	2%	0.1
3	www.agoda.com	18%	0.4
4	www.trivago.com	12%	0.3
5	www.goibibo.com	29%	0.5
6	www.makemytrip.com	10%	0.2
7	www.ebookers.com	30%	0.6
8	www.expedia.com	33%	0.8
9	www.travelocity.com	43%	0.9




socialmention*
Blogs Microblogs Bookmarks Images Video All
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26% strength
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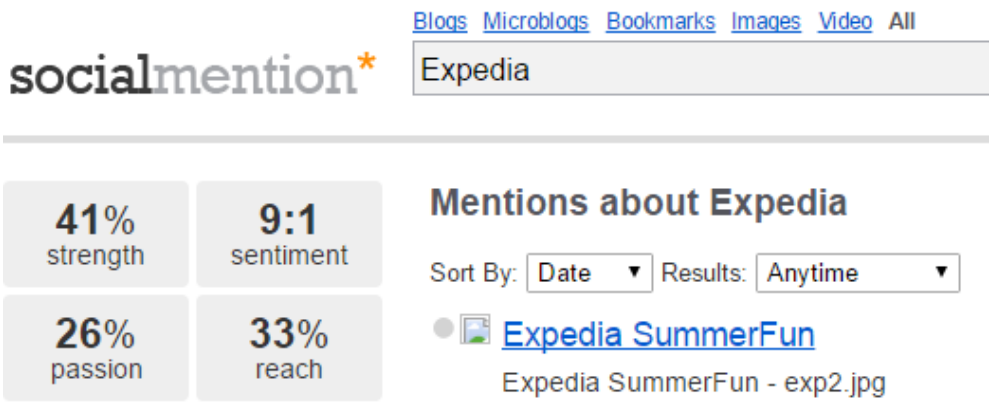
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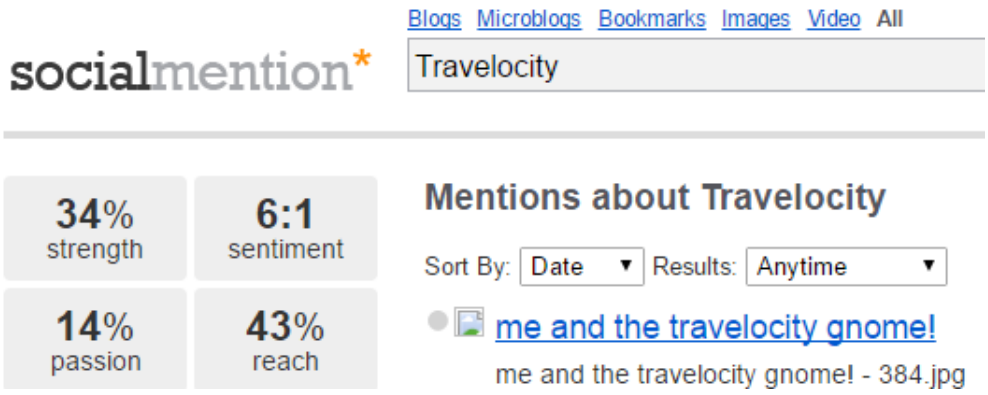
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