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A Novel Model for E-Business and E-Government Processes on Social Media

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Abstract

The global digital economy tends to grow up through the adoption of key technologies, mobility, cloud computing, data mining, artificial intelligence or the extension of social environments. These influences turns up the economy and give rise to new tendencies for obtaining the value. The e-business and e-government strategy is not an easy to organize, although in terms of a fundamental strategy of e-business will be led by the super-expansion of the market. For this reason, the aim of this study is to demonstrate the implications that social media has in the development of electronic business (e-business) and to provide, through a mode, a viable solution to companies or even Governments. We defined a formal setting and have proposed a suite of software architectures with which we can obtain data entry in e-Governance models, that are exemplified in a case study.

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Keywords: E-Business, E-Government, Modelling

1. Introduction

Considering that the research within the framework of e-Government regarding the impact on the economy are relatively new (Stoica & Martin, 2011) a specific evaluation of the impact on the economy is difficult. In addition, the investments for e-Government administrations were not large enough to generate a macro-economic effect (Ghilic-Micu, 2002). We will summarize the traceable impact on the economy. Show the benefits in order to understand the importance of an increase of the investments in e-Government tools of the state. In fact, investments in e-Government solutions are fundamental. First, for the countries that are already developed - which already provide these services -

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to remain in the forehead and the continuous improvement of the services of e-Government. On the other hand, it is very important for the developing countries to invest in the e-Government solutions (Stoica & Martin, 2011). Nowadays they can benefit from the information already provided and communications technologies and to increase the focus on the main purpose of e-Governance, to create benefits for citizens and business of end-users.

From the analysis done up to this point, about the importance of technologies (Martin & Stoica, 2010) we can clearly and easy imagine the impacts of e-Government. These include the improvement of services delivered to enterprises, in particular lower costs, clearly imagined in public procurement (Stoica & Martin, 2011), a better control of public spending, an administration process improved and the increase of incomes for administration, by the implementation of software platforms which can be collected more easily in certain amounts from the State budget.

People who communicate on the internet may constitute what could be called "virtual communities" or "online". According to (Rheingold, 2000), a virtual community is "a social aggregation of people who participate in public discussions long enough, with sufficient human feeling, to form " Webs" of personal relationships in cyberspace." Though their members may be geographically dispersed, virtual communities are similar to traditional communities, even though relations between them can be developed without any physical encounter over time. The consumers participate in virtual communities in order to meet a range of social and psychological needs (Sicilia & Palazón, 2008). According to them, these needs are addressed through a series/number of key values on which online communities include: (1) operational value (for example, advice, information, and expertise), (2) social value (e.g. Many virtual communities are formed around consume activities (Kozinets, 1999). Virtual communities that are formed around a brand called "brand communities" virtual or online (Sicilia & Palazón, 2008). Some branded online communities, such as Harley- Davidson or Macintosh Computers were developed by consumers (Maclaran & Catteral, 2002), while others were built by companies. Virtual brand communities that are developing are supported by companies, which are trying to consolidate its brand image and corporate identity (Maclaran & Catteral, 2002).

2. Used entities

In this section we will define formal entities that are used in the following subsections. Even though our studies will be focused on the social network Twitter, we will give a series of general definitions. The models that are proposed can be used, theoretical, in any social network and the practical way of obtaining entities will be a dependent one on your network.

- **Definition 1.** We note with U the user of a social network. We will suppose that it has all the necessary rights to make the transmission of messages on the network; in addition, its data are accessible.
- **Definition 2**. We note with M the message that is transmitted by a user to some U.

  Definitions 3-6 give the constituent components of interest of a message.
- **Definition 3.** We note with @, $@ \in \boldsymbol{M}$, the multitude of users mentioned in a message. We have @={ U1, U2, U3… Un}, n$\in \boldsymbol{N}$.

  Note: If n=0 corresponds to the situatuion where we do not have any user mentioned in the message.
- **Definition 4.** We note with #, # ∈ M, the multitude of terms of interest from a message. We have # = {T1, T2, T3, ... Tn}, where, i = 1, n, is a term of interest.
- **Definition 5.** We note with B the message body, B = M {@, #}. It represents the sequence of characters that make up the message, less users mentioned, and important terms.

  Definition 6. Important terms extended, note with #ext, is the set of terms that are derived from a term and adding terms that are similar to it.

  Note: The method of obtaining similar terms may be any subjective from the elections and to determine them through automatic processing of messages.

These primary entities allows to obtain additional data, such as the following:

- **Definition 7.** We note with SG (Social Graph) the directed graph with nodes formed of users, which is derived from a term (#), a user (U) or any other entity. The archs graph is given by the process of relaying the messages to users.
- **Definition 8.** We note with C a generic classification of users or messages. Examples of classifications would be classification of users into leaders of the subcomponents of the SG or classifying the messages in positive/negative.

3. General Architecture

In this section we define a general framework.

In Figure 1. It is described the overall architecture of the original model for the generation of e-business processes or e-governance for social media.

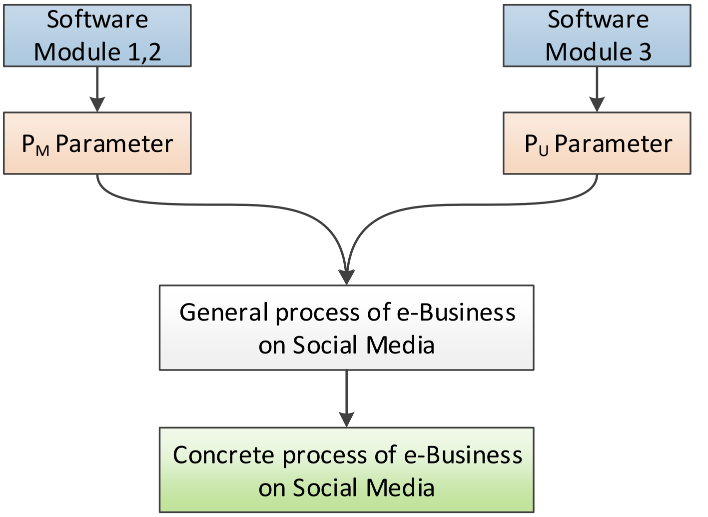

Figure 1. The proposed model architecture.

Architecture, integration and use of modules will give entry parameters in the template that defines, for example, a process of e-marketing, will be described in detail in the following sections.

The description of the parameters is given in Table 1:

Table 1. Entry parameters

Parameter	Description	Aim
P_M	Represents the parameter which defines the message (tweet) transmitted effectively It is obtained by successive attempts and the choice of messages that are classified as viral, so reach a wider mass of users	Removing messages that will have no impact on social media
P_U	Is the parameter that gives the ordered list of users It is obtained as the users who are most active in the network, in the context of similar messages from the past	Determine the users that make up the target group

P_M or P_U parameters are not required, each reaching a different area of the process (see the table describing the parameters). The process of obtaining the parameters should not be restarted every time, it can be quite laborious.

For example, a strategy of "spam" will not use the parameter P_U. In this case all users available will be taken into consideration, and messages will be transmitted as often as possible. P_M will give the message or the structure of the message that will be sent.

The parameters will be entry data in a generic process. It lays down a general framework depending on the objectives pursued. Customizing this general framework will give the final process which will be use.

4. Obtaining parameters

4.1. The general architecture of the software modules

We will analyze a general framework for defining the software modules in Figure 1. In Figure 2 we present a general architecture of used software.

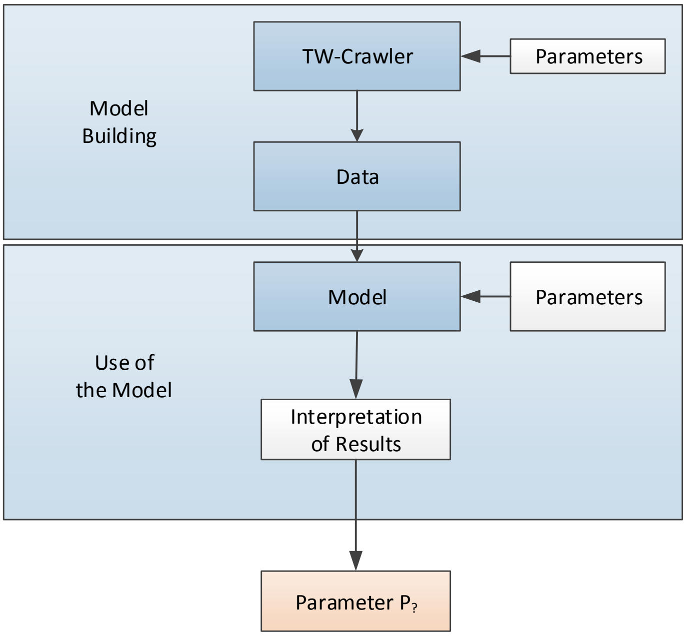

Figure 2. The general architecture of the software modules

Part one, building model that is similar to all the software modules. Obtaining data takes place of interest by choosing the parameters that will be transmitted to the Crawler. These data will then be used for obtaining a model. The model, in our tests was obtained by using classifiers.

4.2. Classification of viral character of the message (software module 1)

4.2.1. The architecture

Figure 3 describes the architecture of software-module 1. This module can be used to determine the viral character of a message, based on the history of similar messages from the past.

Note: in the proposed architecture, module for bringing data from social network tested by us is TW-Crawler.

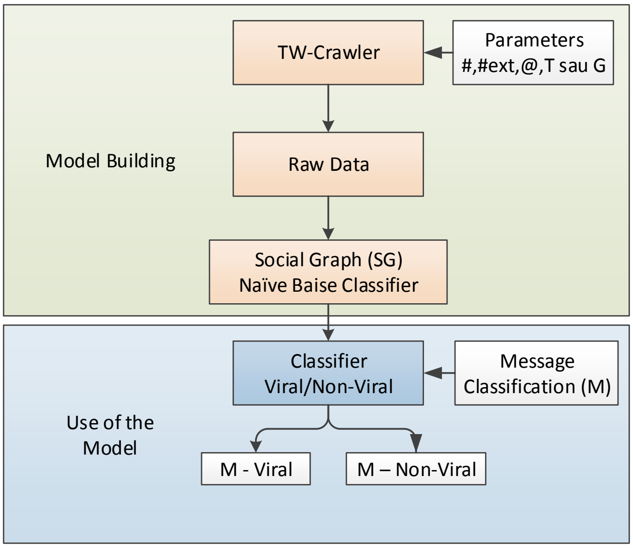

Figure 3. Module software architecture characterization of viral messages/non-viral

Replacing it with any other module will not make other changes in the proposed architecture.

We will present further the steps that you must follow to use the module.

Step 1. Choose the topic of interest (parameter/parameters from TW-Crawler);

Step 2. Tweets obtained shall be divided into viral/non-viral using the criteria chosen by the user. Probably the most simple and practical criterion would be the size of the group generated by the SG classified message;

Step 3. In step 2, we've obtained the classes, so we have training data for Naive Bayse classifier;

Step 4. From this moment this tweet that contains the topic of interest will be able to classify in two classes, viral or non-viral, the answer to the question "is our message going to behave well on the network?”.

4.2.2. Example of use

We want to take into account the experience of election campaigns from the past to determine if a current message will be successful or not. Obviously, one of the criteria that will give success rate is virality of the message, the final goal being to reach as many users as they become potential supporters.

For this we will achieve (automatic) classification of previous messages, messages that contain the same promotion ideas (or similar ideas). Once done the classification, the rating system will allow validation of any message that we want to use later.

4.3. Characterization of messages from the perspective of users (software module 2)

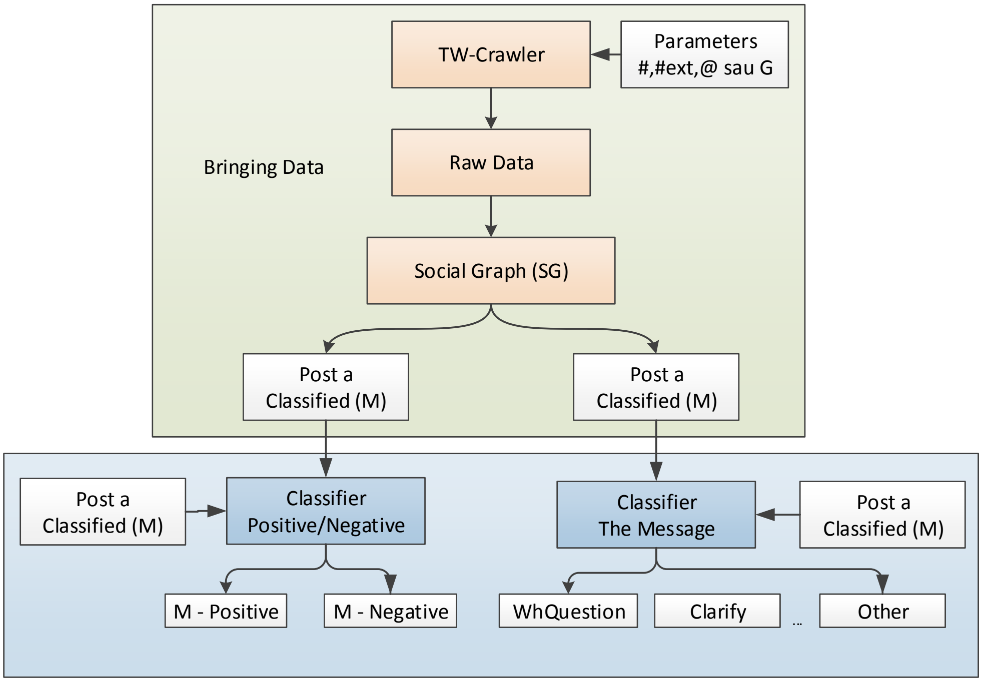

Figure 4. The architecture of characterizing messages

Figure 4 describes the architecture of software module 2. This software module can be used to determine whether a message will be perceived by users as being positive or negative, to classify the message by content type.

Note that in this case we have the classifiers already built. In the case of module 1 is simple to determine automatically whether a message is viral or not, simply by counting the messages that are connected to it. In module 2, on the other hand, we have a personalized message distribution. The training data could not be obtained automatically would need an enormous work of manual classification. That's why I decided to use for training databases classifiers with messages already classified, available free (for English).

This module will have two distinct uses:

- Classification of new messages, to check the perception of the users on the message;
- Classification of messages from the network, so the collection of feedback

4.4. Determining the target group of users (software module 3)

This software module allows you to obtain a set of users of interest for the modelling process. We are interested in users who have a large impact on the social network, so that form or are likely to form a strong opinion over the current network.

Figure 5 presents the architecture of software module 3:

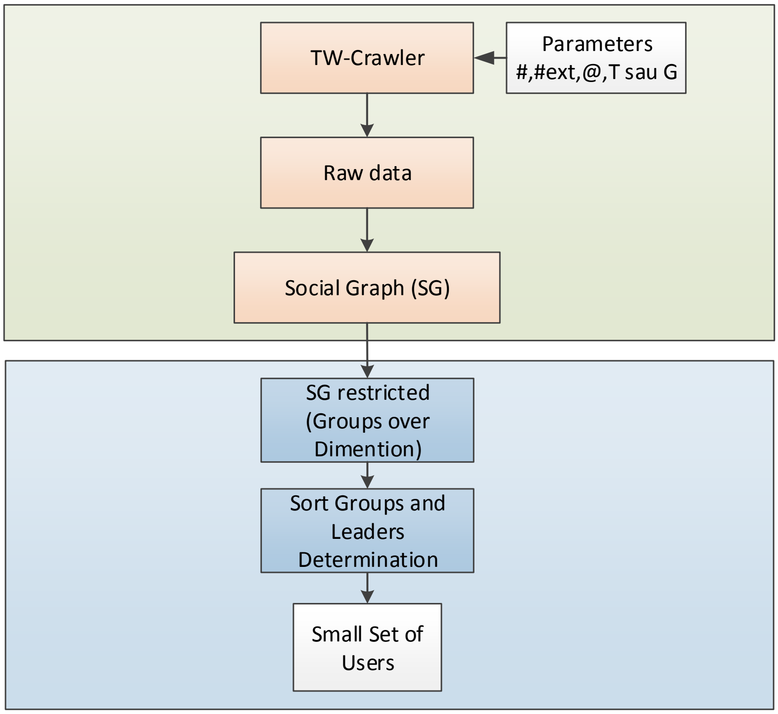

Figure 5. The architecture of module 3

Note that the model does not specify clearly the metric for determining the leaders. In our examples we will use on that metric the size of the Social Graph that forms around a user for a particular message.

4.5. Determination of the user (P_U)

PU in the context of political e-campaign represents users who are interested in an online campaign. Why not send all users? Two simple reasons:

- The message will be able to be associated as being spam more easily, which would result in a negative reaction to the users
- A message that is coming from a regular user of the network will be better received than a message comes directly from the politician.

For the determination of these users of interest we will use data from the past (possibly a previous promotion). SG analysis will give the best users by choosing those who gathered around them most persons, if there are similar messages in history. After removing the non-viral messages, we sort groups formed by choosing the retweet, so obtaining the desired result. P_U in the e-Governance context for this case the P_M will have a lower contribution. In general we do not care about that person who spread the message, the P_M is more important.

4.6. Using P_U and P_M in a e-Government as a feedback mechanism

In this case we want to get results with respect to how it is perceived in the social media a legislative initiative, a specific institution, a public person etc.

This generic process architecture is described in the figure below:

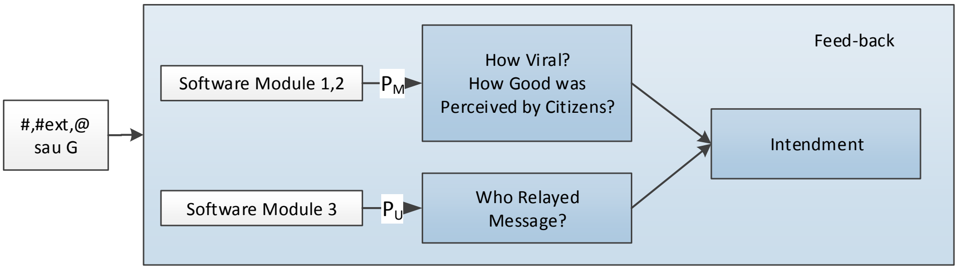

Figure 6. e-Government modelling

5. Case Study - useful data for the e-Government process for # = {"ACTA}

We want to collect and interpret the way that Twitter users perceive the law ACTA, so we start from section # = {"ACTA"}. The results can be expanded to #ext = {"SOPA", "TPP", ANONYMUS"}. For more information about the acronym ACTA it can be read on http://en.wikipedia.org/wiki/Anti-Counterfeiting_Trade_Agreement. The results in this section are based on data extracted from a total of 107.854 users and profiles 323.563 Tweets (mainly in English).

Detailed information about the data used are described in the following table:

Table 2. Used and accessed data

Term	Retrieved tweets	Size (MB)
ACTA	106581	161.3
SOPA	38382	55.6
ANONYMUS	67236	93.5
TPP	111364	179.1

Using the minimum frequency of 2000, I extracted the most common entities, aimed at identifying other important terms that could be linked to the main concept or just are described as being relevant to users. As it can be seen from the following chart we could identify terms such as #tpp (Trans-Pacific Partnership), #pipa (Protect IP Act), #anonymous or #sopa (Stop Online Piracy Act) which are strong interconnected with the main term of (Stoica, Pitic, & Tara, 2012).

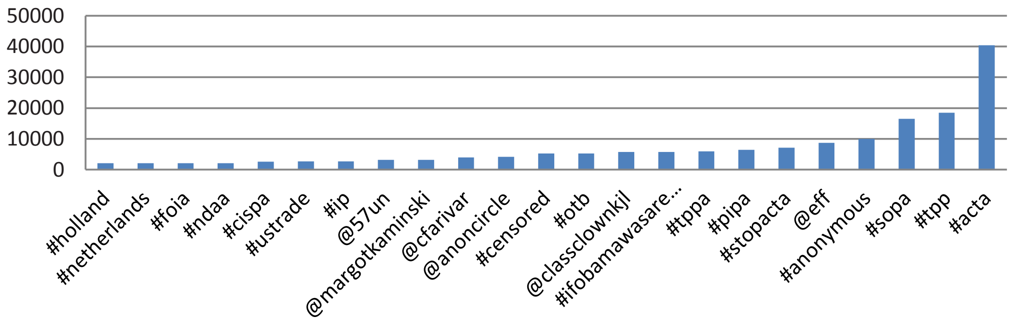

Figure 7. Terms associated with # = {"acta"}

5.1. Determination of parameters P_M and P_U. Interpretation

Determination of the P_M parameter is obtained from the interpretation of Figures 7, 8, 9 and 10.

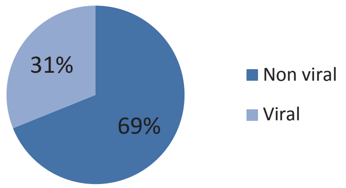

Figure 8. Viral messages for #= { "acta"}

It is observed that a rate of 31% of messages are viral, meaning they were retransmitted at least once. In addition, negative feelings are those that prevail in relation to the three laws (ACTA, TPP, SOPA).

An interesting result is shown in Figure 10, the type of discussions on the topic of ACTA are differently distributed according to countries. A possible explanation would be that, although in small number, messages in the national languages may still occur, but they will not be classified correctly.

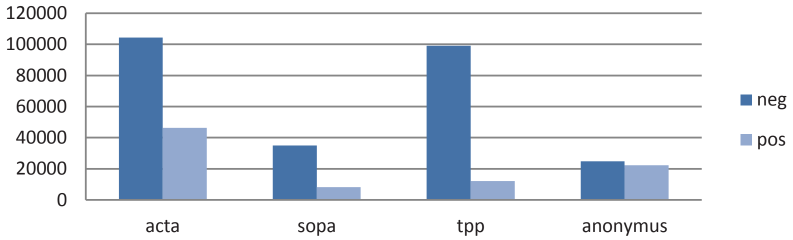

Figure 9. Feelings classification of # = {"ACTA"} and #ext = {"SOPA", "TPP", "ANONYMUS"}

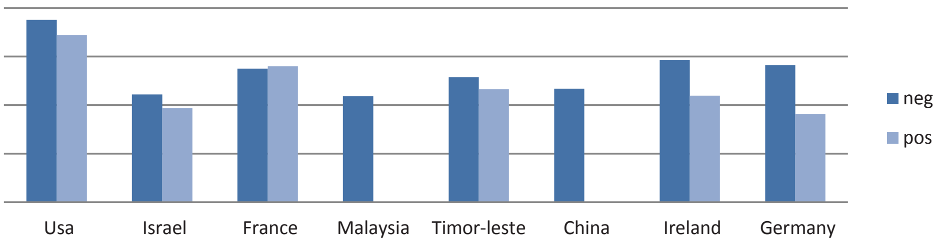

Figure 10. Feelings classification of # = {"ACTA"} by country

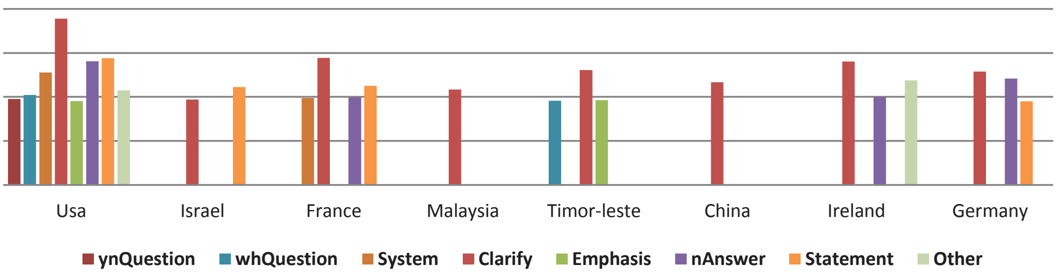

Figure 11. Classification of messages types # = {' ACTA '} by country

In Europe, the countries that are discussing most frequently the subject are France, Germany and Ireland. Despite the large number of messages, number of people in Romania, however, remains extremely small.

P_U is given in Figure 12, but is less relevant in our context.

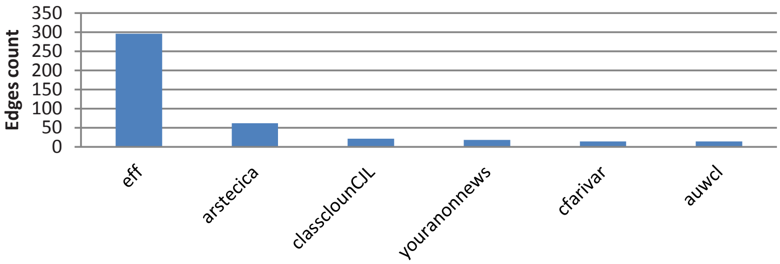

Figure 12. Users of interest # = {"ACTA"}

6. Conclusions

In this work we have proposed to define the general framework for the creation of e-Business models in e-Government. In this context, we have defined entities offered by Social Media and have defined a methodology to obtain two basic parameters (core). The first parameter P_M represents the texts that are sent from a user to another and appears in the context of arrangements of these messages. In our results we have achieved classifications after the impact of message on users, the message type. The second parameter, P_U incorporates information about users and allows their classification according to the influence of the social network.

Our results are based on the results obtained in the course of 6 months at the end of 2012. A conclusion of these results is that using these parameters we can create a model to collect feedback from the masses of people through social media. You can answer to questions such as "What is the citizens opinion of an existing law?" or "A law project which is in a public debate" and users with an influence factor are becoming key elements in supporting the debates.

We propose to extend the research by entering the geographical location, when it is possible to determine physical the communities of interest.

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