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Web Third-person effect in structural aspects of the information on media websites

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ABSTRACT

In this study, the characteristics of what users observe when visiting a media website as wells as the prediction of the impact on oneself, friends and others are researched. The influence that this information has over their opinion verifies the existence of Web Third-person effect (WTPE). With the use of an online survey ($N = 9150$) in all media websites it was proved that the variables that have a greater impact either on others or our friends than ourselves are: The number of users being concurrently online on the same media website, the exact number of users having read each article on a media website as well as the number of users having shared a news article on facebook, twitter, or other social networks. Moreover, age is a significant factor that explains the findings and is important to the effect. Additionally, factors that affect the influence of the user generated messages on others than on oneself were found. Furthermore, the more credible the news is perceived to be and when there is not a particular mediated message the WTPE is absent confirming the existing theory.

1. Introduction

Digital applications are designed to be human oriented, since they address to end users' or customers' needs (Kirschner, Carr, van Merriënboer, & Sloep, 2002) while instructional psychology requires them to integrate some specific psychological and technological characteristics and aspects (Tennyson, 2010). Customers prefer to interact with devices and applications, whose characteristics are designed with the scope to provide familiarity, convenience and effective functionality to them (Kim & Sundar, 2012). Designers create new applications, taking into consideration the rapid and constantly evolving technology and information techniques (Liu, Gibby, Quiros, & Demps, 2002). At the same time several attempts are made, aiming at the fulfillment of re-scenarios and user's satisfaction by the aforementioned applications (Crespo et al., 2011; Yoo & Kim, 2014). It has to be mentioned that an evaluation process is required for every system during its life cycle. The evaluation process includes the implementation of various techniques, which are applicable to any website (Goh & Chua, 2010).

Media websites contain user generated multimodal content (text, images, videos and sound) which adds cumulative value since it is capable of influencing the public opinion (Antonopoulos & Veglis, 2013; Lee, 2012; Spyridou, Matsiola, Veglis, Kalliris, & Dimoulas, 2013). Furthermore, it serves users' satisfaction (Bargas-Avila, Lötscher, Orsini, & Opwis, 2009) by incorporating an efficient and functional navigation design (Cyr & Head, 2013) and may also support users to form opinions about the website in a very limited time period (Lindgaard, Fernandes, Dudek, & Brown, 2006). Web media in order to be attractive to end users, integrate social media aspects to built brand trust (Habibi, Laroche, & Richard, 2014) and take into consideration its users' recommendations (Knobloch-Westerwick, Sharma, Hansen, & Alter, 2005). In this context, one crucial factor that can influence users' media consumption (Klapper, 1960) and is related to the selective exposure of online news, concerns the investigation of Third-person effect (TPE), which was initially introduced by Davison in 1983.

The existence of TPE has been extensively researched in traditional (typical) media, such as newspapers, television stations and radio stations (Eveland, Nathanson, Detenber, & McLeod, 1999; Tal-Or, Tsfati, & Gunther, 2009). In web media have not been conducted similar studies to such an extent and this may be justified by the fact that this is a relatively new research field (Li, 2008). While in traditional media the viewer cannot affect media content, this is not the case for online media. For the purposes of the

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present study and because of the focus on web media the term Web Third-person effect (WTPE) will be used instead of Third-person effect or Third-person perception (Tal-Or, Tsfati, & Gunther, 2009). WTPE has been studied across blogs, online newspapers (Banning & Sweetser, 2007), online news in social media contexts (Schweisberger, Billinson, & Chock, 2014) and by social media metrics (i.e. number of shares and comments) in the process of opinion formulation about health information (Stavrositu & Kim, 2014) (see Table 1). It is worth noting that the above studies are not experimented in prediction modeling.

2. Motivation and problem definition

This paper attempts to present a generalized research on the investigation of the WTPE in all media websites (except blogs), by combining newly defined and multivariate factors regarding the structural aspects of information on media websites. Moreover, the motivation for the current work derives from the attempt to conclude in significant results regarding the properties that affect users' attitudes, while interacting with media websites and social networks. On this ground, the innovation of the presented research relies on the utilization of an extended and diversified sample set, subjected to a thematically and contextually non-oriented responding process, in order to achieve maximum generalization of the formulated behavioral analysis. Furthermore, a breakthrough in this scientific area can be considered the conduction of prediction modeling, while implicating the defined input variables or metrics in evaluation processes and machine learning experiments.

The scope of the current study is to analyze WTPE in the web media context of the messages or factors that the users may receive or observe concerning the number of users that are concurrently online on the same media website, the exact number of users having read each article, the author's name or the article sources and the number of shares and likes that an article receives on social networks. The investigation of the aforementioned factors has been conducted with the structured formulation and distribution of a web questionnaire to all web media types, including social media. These questionnaire-related properties have been statistically processed, aiming at the detection of their respective correlation or relevance to the WTPE effect. Furthermore, several experiments have been conducted for the potential formulation of a generic predictive model, with the utilization of specialized classification algorithms in pattern recognition modules (Roiger & Geatz, 2002; Zhao, Zheng, & Wang, 2008).

3. Literature review

3.1. Third-person effect

The Third-person effect was initially introduced by Davison 1983, suggesting that a number of people tend to believe that they are less influenced compared to others, regarding the message that they receive from a media source. This phenomenon has been extensively studied and found in a wide array of media content, from advertising (Hoffner et al., 1999) to news or political communication (DeLorme, Huh, & Reid, 2006; Duck, Hogg, & Terry, 1995, 2000; Golan, Banning, & Lundy, 2008; Hoffner et al., 1999; Pan, 2006; Rucinski & Salmon, 1990; Schmierbach, Xu, & Boyle, 2012) and from online marketing (Zhang & Daugherty, 2009) to video games (Scharrer & Leone, 2008).

3.2. Third-person effect hypothesis

It should not be overseen that TPE consists of a series of assumptions, which are relevant to public opinion and its effects (Perloff, 1999). Third-person effect appears on all typical media independently of the method employed, the medium under study, the observed content, the flow of questions, and the phrasing or the quality of the message (Perloff, 1999). Various theoretical accounts of the TPE have been proposed, the actor–observer theory (Hoorens & Ruiter, 1996), biased optimism (Brosius & Engel, 1996; Mason, 1995; Rucinski & Salmon, 1990), the elaboration likelihood model (Stenbjerre & Leets, 1998; White, 1995, 1997), the stereotypes of the audience (Perloff, 1993), peoples' projection of negative effects onto others (Fields & Schuman, 1976), or peoples' estimation about an effect on themselves (Gunther & Mundy, 1993) and fundamental attribution error (Gunther, 1991; Ross & Fletcher, 1985; Ross, Greene, & House, 1977). Furthermore, TPE is more obvious when a negative or controversial message is mediated by the content, such as gambling advertisements (Youn, Faber, & Shah, 2000), political advertisements (Wei & Lo, 2007), pornography content (Lo & Wei, 2002) and reports about violence (Hoffner et al., 1999). Therefore, the perceived effect on others deriving from the aforementioned media content is stronger than the influence over oneself. A survey of 264 adults examined TPE existence through product advertising and it also concluded that negative content-based TPE was greater than positive effect (Huh, Delorme, & Reid, 2004). More specifically, in younger aged groups, results of TPE among children, who watched advertisements about smoking (negative message), proved that the effect is the product of a superiority bias (Henriksen & Flora, 1999). Moreover, an experiment implicating involving 181 individuals investigated and verified the psychological aspects, origins and mechanisms of TPE (Brosius & Engel, 1996). Chapin, in 2002, studied TPE influences of school and media violence in the lives of 1500 middle school and high school students. In the same context, the research of Eveland et al., 1999, investigated whether TPE is influenced by social distance or perceived likelihood of exposure. Similarly, Gunther and Mundy (1993) have stated that the effect is valid only for negative effects of media. McLeod, Eveland, and Nathanson (1997) analyzed the TPE for censorship of violent and misogynic rap lyrics on a sample of 202 college students. Finally, a telephone survey was contacted about a trial (controversial content) and affirmed that people perceive news media coverage to

Table 1
Previous research studies on Web Third-person effect.

Reference	Scope and media sources		Grouping structure	Supported WTPE hypotheses
Banning and Sweetser (2007)	Investigating WPTE in the medium or the messenger ($N = 145$)	Personal blogs, media blogs, online and print newspaper	Self and others	Relevancy of the message orientation. Independency of the medium
Schweisberger, Billinson, and Chock (2014)	Investigation of perceived message influence and WTPE ($N = 88$)	Facebook	Self and others	WTPE dependency by the news stories relevancy, quality and the supported medium (Facebook)
Stavrositu and Kim (2014)	Investigation of the impact regarding the number of shares and comments on WTPE ($N = 144$)	Professional news blog	Self and others	With single story and context. Cancer risk news story interact with social media metrics. The conveyed story and the relevant social media metrics influence WTPE

exert greater influence on other people than on themselves (Salwen & Driscoll, 1997).

Sundar & Nass, in 2001, claimed that readers prefer articles, which appear to be appreciated and selected by many other users and furthermore, they want to be informed from their social environment (Neuman, Just, & Crigler, 1992). Also, it has been found that the number of followers of a twitter account can influence the perceived credibility of the content for the users, who read the respective news account (Westerman, Spence, & Van Der Heide, 2012). Users' observations of such published content serve as feedback via recommendation-ratings procedures (Lee, 2012) and add value to the content, thus influencing ourselves and others (Stavrositu & Kim, 2014). The social distance from ourselves to others is based on the observed dissimilarities between us and the compared others (Eveland, Nathanson, Detenber, & McLeod, 1999), which has been found as a major factor that moderates TPE. Based on the above justification, many scientists when they research the effect they use comparison groups addressing oneself, ingroup and others (Gardikiotis, 2008; Pan, 2006; Wei & Golan, 2013; Zhong, 2009). The current work employs the same groups (friends and others), following Brosius and Engel (1996). Furthermore, as it was mention in introduction WTPE is referring to the effect regarding only to web media (see Table 1).

Based on the above, we formulate the following hypotheses (H), while researching WTPE:

H1. The number of users, which are concurrently online on the same media website, will be perceived to have a greater impact on others or our friends than ourselves. (The above characteristic will be referred as "*user online*".)

H2. The exact number of users, who have read each article on a media website, will have a greater impact on others or our friends than ourselves. (The above characteristic will be referred as "*online article*".)

In a world of infinite and multimodal information, which is constantly changing, a user is called to decide if he or she believes whatever he or she reads and at what extent. Impersonal impact hypothesis (Tyler & Cook, 1984) explains why the users are influenced by media regarding matters of community, judgment, beliefs, present risk and their assumptions for their vulnerability to this risk. However, as it is explained in the differential impact hypothesis, the interpersonal sources of information are more influential than the mass media sources, since the latter are able to have effect on individuals when they get involved (Basil & Brown, 1997; Snyder & Rouse, 1995).

The present research paper also examines at which extent users are influenced when they observe the source of information (website, author or primary source). In previous research it has been found that reader's hostile (bad opinion) or friendly attitude (good opinion) towards the source of information, influences oneself reversely, regarding the perceived message. A defamatory article from a hostile source is considered to affect other peoples' attitudes more than a relatively friendly source (Cohen, Mutz, Price, & Gunther, 1988). On the other hand, Gunther's (1991) findings support the idea that the intentions of a source of information are seen as having either no effect on others, or a similar but weaker effect on others than on oneself.

H3. The author's name or the sources of the article on a media website will have a greater impact on others or our friends than ourselves. (The above characteristic will be referred as "*source*".)

It is known that media metrics, such as number of likes and comments, are used to increase interactivity (sharing and seeking information) (Park, Gu, Leung, & Konana, 2014), web traffic, audience feedback (Lee, 2012) content credibility (Knobloch, Sundar, & Hastall, 2005; Westerman, Spence, & Van Der Heide, 2012), and influence (Stavrositu & Kim, 2014). Also, they offer a kind of evaluation–recommendation-rating (Walther et al., 2012).

H4. When users read an article on a media website and notice that many users have posted it on facebook, twitter or other social networks, this information will have a greater impact on others or our friends than ourselves. (The above characteristic will be referred as "*social*".)

3.3. Third-person effect metrics

It has been concluded that online and offline worlds are connected (Amichai-Hamburger & Vinitzky, 2010; Mesch, 2012), in the context of an effort to establish an online trust relationship between users and web media (Corritore, Kracher, & Wiedenbeck, 2003; Joinson, Reips, Buchanan, & Schofield, 2010; Krasnova, Spiekerman, Koroleva, & Hildebrand, 2010; Paine et al., 2007).

According to a research conducted in Greece in 2013, a percentage 59.9% of the population uses the internet and 77.1% read online news (Ntouros, Chalkiadaki, & Zouliatis, 2013). An important fact though, is considered not only the information a user reads, but also the familiarity that the user has with internet content (expertise and time) and the relative skills in order to be capable of evaluating the sources of information (Van Deursen, Courtois, & van Dijk, 2014). User's own perception of online experience and time spent online (Roussos, 2007), could be considered as crucial factors with significance on WTPE. Furthermore, it has been found that technical characteristics and tools in Greek news websites, such as the writer's name of the published articles, the social media metrics (likes, shares and emails), the ranking of the article, the users' comments in the articles (Antonopoulos & Veglis, 2012) and the option for the user to sign up into a media website via an existing social network account (Antonopoulos & Veglis, 2013) are widely utilized. The above factors indicate the adoption of technical specifications and functionalities in the design of a media website that adds value to its content.

The user's age and the website usability are sufficiently related, while researchers provide a number of insights on this fact (Wagner, Hassanein, & Head, 2014). Age, education (Boster & Mongeau, 1984; Meyrick, 2001; Pechmann, Zhao, Goldberg, & Reibling, 2003; Tiedge, Silverblatt, Havice, & Rosenfeld, 1991) and perceived knowledgeability (Driscoll & Salwen, 1997; Price & Tewksbury, 1996) are also proved to be related with TPE, something that the present study (WTPE) examines as well.

4. Method

4.1. Measures and procedure

The online survey consisted of questions, containing demographics (gender, age, education and income) and internet usage (how often they are online, the hours spend online and the perceived expertise of internet usage). All questions, except gender, age and educational background, were answered on a five-point scale, with the higher numbers representing positive response or agreement. The second part included the question if the participants are willing to pay, in order to log onto a website that provides services, documents and videos, which they find interesting. Furthermore, the second part included mainly Web Third-person effect measures; participants were asked whether they observe the number of users concurrently connected at the same time and then whether they think that such information

can influence their opinion (or their friends' and others') for the media website (e.g. "*Do you think that the information of the number of users who are concurrently online with you on the same website can influence yourself, friends and others?*"). The questionnaire also measured whether participants observe the number of users that have read an article and whether such information can influence their opinion (or their friends' and others') for the media website. Moreover, the users were asked if they observe the name of the author of an article and similarly whether they think that the provision of such an information can influence their opinion (or their friends' or others') for the media website. Finally, participants were asked whether they think that when they read an article that other users have put it on their social media account (such as facebook or twitter or other) can influence their opinion (or their friends' or others') for the media website. The last question was "How much money per month are you willing to spend for access services, documents and videos that you find interesting?". The survey was extended in three different types of Greek media websites and more specifically, in a national broadcasting tv station, a radio station and a local newspaper distributed only in an island. The above media have also websites running at the same time with their typical presence. Moreover, the questionnaire was delivered by a news portal and social media (facebook and twitter). All participants responded to the same questionnaire irrespectively to the medium. The survey was available online on each website exclusively (with no overlapping period) for a temporal duration of two to three weeks, in the period January to March 2014. The data regarding the number of friends and followers, that are presented below, derive from the official social media accounts of each medium (we assume this numbers indicate the population visiting each website) and refer to the same period of the research.

In their basic integrated functionalities, google page rank evaluates the credibility and the uniqueness of the information presented by google ranking algorithm, while alexa Greek rank additionally indicates the number of users visiting the Greek websites. A national tv station website (with google page rank six and alexa Greek rank 118) promoted the survey through a splash screen, an advertising banner, an article describing the study and a tweet from its official twitter account (50000 followers). A radio station (with google page rank four and alexa Greek rank 5468) was engaged in the same survey through an advertising banner and a post from its official twitter (9703 followers) and facebook accounts (166966 friends). A newspaper website (with google page rank five and alexa Greek rank 2097) promoted the survey by an advertising banner, an article and a post on its official facebook page (4136 friends). A news portal (with google page rank five and alexa Greek rank 290) used similar ways of distribution by an advertising banner, an article and a post on its official facebook page (138190 friends). Another method of survey delivery was followed via mailing lists and social networks (mainly deriving from the Aristotle University of Thessaloniki, with 34406 friends). All participants were firstly informed about the purpose of the study, and then they provided their consent to participate in the online survey, while full anonymity and confidentiality were primary prerequisites. The survey followed the ethical guidelines of Aristotle University of Thessaloniki.

4.2. Participants

The participants of the online survey, which were fluent in Greek language, were 9150 adolescents and adults (see Table 2) with a unique Internet Protocol address (IP) and with an age range from 10 to 79 years ($M = 29.94$; $SD = 11.21$).

The online survey involved a question about the user's personal monthly income regardless of its source (work, parents, bonus, etc.), while the possible answers varied from zero (no income) to more than 2001 euros. Based on the descriptive analysis, the most frequent category was participants with a monthly income of 0–400 euros ($N = 4296$). Most participants were graduates of higher education institutes (with a degree or diploma from a public or private institute $N = 3107$) and the second most popular group was undergraduate students in higher education ($N = 2736$).

Table 2
Participants' demographics for gender, income and education.

Factors	Answers	Frequency	Percentage (%)
Gender	Female	5845	63.9
	Male	3305	36.1
	Total	9150	100
Monthly income (euros)	0–400	4296	47
	401–800	1876	20.5
	801–1200	1562	17.1
	1201–1600	689	7.5
	1601–2000	304	3.3
	2001+	423	4.6
	Total	9150	100
Education	Elementary	67	.7
	Junior high school	367	4
	High school	1064	11.6
	Student	2736	29.9
	Graduate	3107	34
	Master's degree student	455	5
	Master's degree graduate	916	10
	Phd candidate	182	2
	Phd holder	256	2.8
	Total	9150	100

All participants were initially asked to report how often they use internet, by selecting one of the five categories ((1) Daily, (2) 4–5 times a week, (3) 2–3 times a week, (4) Once a week, (5) Once a month). Only those that selected the "Daily" option ($N = 8617$) were prompted to report how many hours they use the internet on a daily basis, selecting from five categories. The most frequent category was '3–6 hours' daily ($N = 3802$) and the second one was '1–2 hours' ($N = 2865$). It has to be noted that 7.7% ($N = 706$) of the samples stated that they are all day online. Moreover, the users were questioned about their familiarity with internet technologies and the answers ranged in five categories ((1) No familiarity, (2) Beginner, (3) Moderate familiarity, (4) Skilled, (5) Professional). The most populated group was 'Skilled' ($N = 5514$) and the second one was 'Moderate familiarity' ($N = 2139$). Additionally, 13.8% ($N = 1260$) of the samples considered themselves as 'Professional'. Furthermore, all of the above characteristics were firstly statistically processed for detection of relevancies and subsequently considered as input description parameters or variables, in the process of structuring a classification or prediction model, based on the Web Third-person effect.

4.2.1. Sample sources

The most frequent web media source was tv ($N = 7922$; 86.6% of the sample), the second one was email – social media ($N = 569$; 6.2%), followed by news portal ($N = 506$; 5.5%), radio ($N = 107$; 1.2%) and newspaper ($N = 46$; 0.5%). The various response rate of each media source is explained by google and alexa ranks, the respective social media followers or friends and the selected survey promotion means. A media website with low google and alexa rank and with a small number of social media followers and friends it is expected to appear a lower response rate on the online questionnaire than a popular one. Furthermore, based on the media source through which the user completed the questionnaire, the preliminary analysis indicated no differences in responses, regarding the WTPE among the various media sources (tv, radio,

newspaper, portal and email – social media), and therefore all samples were engaged for the analysis and the subsequent experiments.

4.2.2. Exclusion criteria

Seventy-six participants were excluded from the sample for the following reasons: participants reporting an age below (<) 16 years old and personal monthly income into the second category and above (more than 401 euros) because of potential false statement. Besides, the users that answered two or more times through the same IP-Internet Protocol address were not included. Finally, those who gave inconsistent answers in the following two specific items were also excluded from the sample. These questions were "*Are you willing to pay in order to log onto a website that provides services, documents and videos that you find interesting?*" and "*How much money per month would you spend for access services, documents and videos that you find interesting?*", which may potentially infer strongly controversial answers-arguments.

4.3. Behavioral variables for the Web Third-person effect hypothesis

The users were asked to indicate whether they have observed in the media websites specific information about the number of users, who are online simultaneously with them, the exact number of users, who have read each article and its corresponding author or source. Regarding the above questions the WTPE could be only measured in participants that responded with values above ($\geqslant$) 3 on the 5-point scale (Never = 1, Seldom = 2, Half of the times = 3, Often = 4, Always or almost always = 5). In the first question 7345 (80.2%) users responded with values greater ($\geqslant$) than 3, while in the second question 6357 (69.4%) and in the third question 7725 (84.4%).

4.4. Analytical methodology

In order to test the four hypotheses (H1, H2, H3, H4) a series of analyses of variance were conducted. For the examination of the relationships between input factors and WTPE, correlational analyses employing Pearson's r coefficient, analysis of variance (ANOVA) and multiple analysis of variance (MANOVA) were performed with the use of the statistical software package for the social science.

The second analytical step was to generalize the above methodology in the context of a prediction modeling via supervised training techniques. There are many data mining methods that can be employed for the classification and pattern recognition problems, including statistical Linear and Logistic Regressions, artificial neural networks topologies, Support Vector Machines, and k-Nearest Neighbors implementations (Roiger & Geatz, 2002). Several experiments have been conducted, in order to compare the performances of training algorithms, concluding in the fact that artificial neural networks usually implicate a more efficient and balanced performance in various classification problems and taxonomies (Kotsakis, Kalliris, & Dimoulas, 2012). Since the scope of the present work is not to present an overall overview of the training algorithms, but rather to proceed in classification and prediction modeling in the area of WTPE, in the following supervised machine learning experiments artificial neural networks are mainly implemented. These topologies are graphs, synthesized by nodes, which are connected via differentiated weighted links in specific layers. The input layer of the topology includes the nodes that represent the input variables (questionnaire factors or questions) that have been discussed in the previous section, while the output layer involves the classification nodes of the selected taxonomy. Finally, the intermediate or hidden layers include nodes that try to determine, via weighted linking and trigger functions (training and propagation methods), the most efficient way to connect the input layer to the output layer. In the current work, regarding the network form, artificial neural systems with 2-hidden-layers (with sigmoid trigger functions) and a linear output layer were finally employed, while many tests have been carried out for the detection of efficient network size (Bishop, 1995) and number of neurons. The machine learning experiments were conducted in the Waikato Environment for Knowledge Analysis (WEKA version 3.6), which is an open source software specialized in data mining procedures (Hall et al., 2009). Moreover, an interesting matter that has been addressed, refers to the investigation of the impact of the input properties, in terms of a ranking description according to each taxonomy that is implemented. For this reason, a ranking algorithm is utilized in WEKA environment, the "*InfoGainAttribute Evaluation*" (Hall et al., 2009), which tries to evaluate the importance of each property via entropy and information gain measures. It has to be noted, that different scales can be formulated, when a different classification problem is addressed, even if the same properties serve as input variables in the model. Furthermore, the k-fold cross-validation technique was also employed in all the training experiments. According to this method the initial set of input samples is randomly divided into k-subsets, $k-1$ of which are used for training or developing the model (predictor) and the last one is utilized for testing the model with the unknown unclassified samples, while the whole process of validation is repeated k times iteratively (Rodriguez, Perez, & Lozano, 2010). In this way, all the input samples are finally engaged in some point either as training or testing data. Moreover, the k-fold validation technique is essential for the calculation of a weighted classification performance and for the elimination of overtraining problems due to small input sets of samples, leading in training of efficient models, which rather fail in test experiments because of the bias or dependency on the training data. Furthermore, the iterations of the validation method favor the attainment of maximum possible generalization rules according to the classification problem.

5. Results

5.1. ANOVA on each technical characteristic

A repeated measures ANOVA (target of comparison: self, friends, others in general) was employed, in order to test the WTPE on each technical characteristic that was observed by the user in each media website (*user online, online article, source, social*). Each question was analyzed separately in Table 3.

Regarding the user online item (i.e. "*Do you think that the information of the number of users which are concurrently online with you on the same website can influence yourself, friends and others*"), the results showed statistically significant differences on the level of influence [$F(2, 7344) = 1487.21$; $p < .0001$; $\eta_p^2 = 0.168$;

Table 3
Mean perceived influence of each technical characteristic across targets of comparison.

Sample	Self	Friends	Others
User online	2.30*	2.48*	2.91*
($N = 7345$)	(1.21)	(1.08)	(1.10)
Online article	2.49*	2.71*	3.10*
($N = 6357$)	(1.23)	(1.07)	(1.09)
Source	3.36*	3.20*	3.34*
($N = 7725$)	(1.20)	(1.05)	(1.01)
Social	2.28*	2.74*	3.06*
($N = 9150$)	(1.14)	(1.03)	(1.07)

Note: mean ratings range from 1 to 5, higher number indicating more influence.
* All significance was at $p < .0001$. Numbers in the parentheses are standard deviations).

power = 1.000)] with the self being less influenced (X = 2.30; SD = 1.2) compared to friends (X = 2.48; SD = 1.08) [F (1, 7344) = 264.071; p < .0001; η_p^2 = 0.035; *power* = 1.000)] and others (X = 2.91; SD = 1.10) [F (1, 7344) = 2131.95; p < .0001; η_p^2 = 0.225; *power* = 1.000)]. Similarly the difference between friends and others was also significant [F (1, 7344) = 1903.27; p < .0001; η_p^2 = 0.206; *power* = 1.000)]. Due to the increased sample size and high power, effect sizes were calculated for each item. For *user online* the effect size is 0.168 explaining approximately 17% of the variability.

For the *online article* item (i.e. "*Do you think that the information on the exact number of users having read each article can affect yourself, friends and others*") the results showed statistically significant differences on the level of influence [F (2, 6356) = 1370.18; p < .0001, η_p^2 = 0.177, *power* = 1.000)] with the self being less influenced (X = 2.49, SD = 1.23) compared to friends (X = 2.71, SD = 1.07) [F (1, 6356) = 389.208; p < .0001; η_p^2 = 0.058; *power* = 1.000)] and others (X = 3.10, SD = 1.09) [F (1, 6356) = 1911.25; p < .0001; η_p^2 = 0.231; *power* = 1.000)]. Similarly the difference between friends and others was also significant [F (1, 6356) = 1549.92; p < .0001; η_p^2 = 0.196; *power* = 1.000)]. For *online article* the effect size is 0.177 explaining approximately 18% of the variability.

For the *source* item (i.e. "*Do you think that the information about the author's name or the article's source can influence yourself, friends and others*") the results showed statistically significant differences on the level of influence [F (2, 7724) = 167.907; p < .0001; η_p^2 = 0.066; *power* = 1.000)]. The self was more influenced (X = 3.36; SD = 1.2) compared to friends (X = 3.20; SD = 1.05) [F (1, 7724) = 300.572; p < .0001; η_p^2 = 0.037; *power* = 1.000)] and friends compared to others (X = 3.34; SD = 1.01) [F (1, 7724) = 328.293; p < .0001; η_p^2 = 0.040; *power* = 1.000)]. There was no significant difference between self and others. For *source* the effect size is 0.06 explaining 6% of the variability, therefore it is assumed that this is a non-significant effect.

Finally, for the social item (i.e. "*When you read an article on a website and notice that many users have posted it on facebook, twitter, or other social networks do you believe that this information can affect yourself, friends and others*") the results showed statistically significant differences on the level of influence [F (2, 9149) = 2955.77; p < .0001, η_p^2 = 0.244, *power* = 1.000)] with the self being less influenced (X = 2.28; SD = 1.14) compared to friends (X = 2.74; SD = 1.03) [F (1, 9149) = 2193.617; p < .0001, η_p^2 = 0.193, *power* = 1.000)] and others (X = 3.06; SD = 1.07) [F (1, 9149) = 4027.594; p < .0001, η_p^2 = 0.306, *power* = 1.000)]. Similarly the difference between friends and others was also significant [F (1, 9149) = 1590.767; p < .0001; η_p^2 = 0.148; *power* = 1.000)]. For social the effect size is 0.24 explaining approximately 24% of the variability.

5.2. Differences on the influence of the self

Based on the obtained results, a repeated measures ANOVA (*user online, online article, source* and *social*) was employed in order to explore differences in the perceptions of influence on self. The results showed statistically significant effect [F (3, 4658) = 1486.34; p < .0001, η_p^2 = 0.24; *power* = 1.000)] with the *source* being the most influential characteristic on the self (X = 3.40; SD = 1.19) compared to *online article* (X = 2.50; SD = 1.24) [F (1, 5451) = 2399.31; p < .0001, η_p^2 = 0.306; *power* = 1.000)], and to *user online* (X = 2.34; SD = 1.22) [F (1, 6279) = 3742.79; p < .0001, η_p^2 = 0.374; *power* = 1.000)] and to *social* (X = 2.35; SD = 1.16) [F (1, 7725) = 4488.64; p < .0001, η_p^2 = 0.37; *power* = 1.000)]. *Online article* (X = 2.50) was also perceived more influential on self as compared to *user online* (X = 2.34) [F (1, 5395) = 158.414; p < .0001, η_p^2 = 0.029; *power* = 1.000)] and to *social* (X = 2.35) [F (1, 6357) = 110.741; p < .0001, η_p^2 = 0.017; *power* = 1.000)]. *User online* and *social* were significantly different, F < 1.

In order to explore age differences in the WTPE, we have employed a MANOVA with age as an independent variable with five groups (10–20, 21–30, 31–40, 41–50, 51+). The WTPE was established from subtracting the influence on *others* minus the influence on the self (others minus self). Thus four dependent variables were created for the "*user online*", "*online article*", "*source*" and "*social*" items (see Table 4).

The results showed statistical significant effects on "*user online*" [F (4, 7340) = 6.386; p < .0001; η_p^2 = .03; *power* = 1.000)], with the youngest age group (10–20) showing the smallest effect as comparison to the rest of the age groups, "*online article*" [F (4, 6352) = 11.528; p < .0001; η_p^2 = .07; *power* = 1.000)], with the youngest group (10–20) showing the smallest effect, followed by the next two age groups (21–30 and 31–40) and finally the last two age groups (41–50 and 50+), and "social" [F (4, 9145) = 14.56; p < .0001; η_p^2 = .06; *power* = 1.000)], with the youngest age group (10–20) showing the smallest effect, followed by the next group (21–30), the next two groups (31–40 and 41–50), and the last age group (50+). There was no significant effect of age on the WTPE of "*source*" [F (4, 7720) = 1.150; p = 0.352]. Post hoc tests on the means were conducted using simple comparisons with a Bonferroni correction (p < .0167).

5.3. Correlations

In order to examine relationships among the variables, Pearson's correlation coefficients were computed, for each variable in relation to age, internet use, education and monthly income. We have found that age was correlated with the effect on self and others on the *"user online"* variable in a negative direction (r = −.116; r = −.058; and r = −.079 respectively; all *ps* < .0001). Age also correlated with internet use (r = −.104), education (r = .306; p < .0001) and monthly income (r = .576; p < .0001). Additionally, age was negatively correlated with the effect on self and others on the *"article online"* variable (r = −.166; p < .0001; r = −.099; p < .0001 and r = −.105; p < .0001 respectively). Finally, age was negatively correlated with the effect on self and others on the *"social"* variable (r = −.162; p < .0001; r = −.113; p < .0001 and r = −.084; p < .0001 respectively).

A negative correlation between observing the source and perceived influence of the "*source*" to self and others was also significant (r = .278; p < .0001 and r = −.119, p < .0001). In essence, when you observe the *source* of the article the perceived influence on the self increases and the WTPE decreases. On the contrary, observing how many users are online at the same time in a website is related to the influence on the self but not to the WTPE (r = .104).

5.4. The factors that predict Web Third-person effect hypothesis

Factors that may potentially predict the influence on the self and others were implemented in the experiments for each technical characteristic separately (WTPE was proved for *user online, article online* and *social* except *source*) with the same exclusion criteria. The prediction was focused only on questions where WTPE was proved (see Table 3) and only for the participants, who believe that others are influenced more than oneself on the 5-point scale (Never = 1, Seldom = 2, Half of the times = 3, Often = 4, Always or almost always = 5) and therefore ignoring all those that answered "Half of the times". The following classification model attempts to discriminate the users, who are effected by WTPE, from the whole set of samples. The final number of the implicated samples or users for the prediction modeling in the first question (*user online*) was 3661 users, in the second question (*online article*) 3163 and in the third question (*social*) 4588. Furthermore, the

Table 4
Mean differences on the influence of others minus the self (others-self) across five age groups.

Age groups	10–20 (N = 1477)	21–30 (N = 3064)	31–40 (N = 1581)	41–50 (N = 791)	51+ (N = 432)
User online	0.49_{a} (1.14)	0.63_{b} (1.11)	0.63_{b} (1.15)	0.67_{b} (1.2)	0.73_{b} (1.14)
Online article	0.46_{a} (1.13)	$0.60_{b,c}$ (1.08)	$0.64_{b,c}$ (1.12)	0.73_{c} (1.13)	0.82_{c} (1.16)
Source	0.02 (1.03)	−0.03 (1.00)	−0.04 (1.01)	0.005 (1.03)	−0.009 (1.07)
Social	0.64_{a} (1.2)	0.76_{b} (1.16)	$0.83_{b,c}$ (1.16)	$0.86_{b,c}$ (1.17)	1.02_{c} (1.17)

Note: Numbers in parentheses are standard deviations. Means values in the same row that do not share subscripts differ at $p < .017$. Individual cell means were compared using simple comparisons with Bonferroni t tests at $a = .167$.

same age groups were used, adjusted in a five group scale (10–20, 21–30, 31–40, 41–50, 51+), while the remaining input variables remained the same (gender, monthly income, education, how often they are online, hours spent online and users' perceived expertise on the internet).

The ranking algorithm "*InfoGainAttribute Evaluation*" in WEKA programming environment was employed for the evaluation of the factors and their respective impact in the classification performance. Therefore, this technique was utilized separately for each taxonomy (*users online*, *online article* and *social*), taking also into consideration an annotation process for each of the sample. Consequently, the existence of WTPE in each of the questions was determined by answers 1 or 2 for oneself and simultaneously 4 or 5 for others, while the opposite phenomenon indicated a non-WTPE affection of the respective sample (Self vs Others). In this way, a ground truth data base was formulated for each scheme, as all samples are represented by the input set of variables and the respective label according to the question under investigation. This ground truth set is essential for the subsequent machine learning experiments. The results of the "*InfoGainAttribute Evaluation*" are presented in Table 5. The overall classification performance of the machine learning algorithms is assessed via the pattern recognition accuracy, defined as the percentage (%) ratio of correctly classified samples to the total number of input samples.

As stated before, the classification method in the current work was artificial neural networks topologies, which provide efficient pattern recognition accuracy. Moreover, for the employed k-fold validation technique was selected $k = 10$ and therefore, input samples were randomly divided into $k = 10$ subsets, nine of which were used for training and the last one for testing the model, while the whole process was repeated 10 times. Table 5 presents the classification performances for the three taxonomies (*user online*, *online article* and *social*). It has to be noted that the implemented schemes provided high discrimination rates, especially in the user online and online article cases. While interpreting the results, it can be mentioned that the formulated input set of variables can be applicable for the discrimination of users that may be affected by WTPE for the *user online* output, with an 81.3% success rate. According to the above, the performance results for the *online article* factor remained also high in 80.65%, while a slight decrease appeared for the *social* with 71.1% efficiency. Moreover, it is important to state the absolute resemblance of the ranking of input characteristics for the *user online* and *social*, while slight differentiations was expressed in the input vector for the *online article*.

6. Discussion

Social web applications create a natural tendency to people to follow each other (Emerson, 1976; Farzan & Brusilovsky, 2011). Reputation systems such as online readers, source, views, and shares-likes on an article are important heuristic cues utilized when a user takes a decision concerning the credibility and trustworthiness of online news and products (Van Der Heide, Johnson, & Vang, 2013). The aforementioned study is related to the users' influence by the mediated messages that the websites convey (*user online*, *online article* and *social*), favoring the deployment of social user generated content (recommendation), which implements WTPE potentials.

As researched in H1, H2 and H4, when recommendation systems on a web media are observed and are adjusted by the users on their own, they constitute a form of online word of mouth distribution (Lance & Guy, 2006), adding credibility, and also they could be interpreted as representativeness (Sundar & Nass, 2001) by the readers. The above assumptions have been proved via the statistical research, which offers an additional parameter in the WTPE, because the more vigilant the user is, the more the predictability of the WTPE is increased. Furthermore, the gaps between what the users believe about themselves, friends and others fit well with most theoretical accounts of TPE, either those focusing on the cognitive underpinnings of the phenomenon such as the actor–observer theory (Hoorens & Ruiter, 1996), or those stressing the motivational power driving the effects such as peoples' estimation about an effect on themselves (Gunther & Mundy, 1993). The statistical analysis conclude in the fact that no significant TPE was found for the WTPE on H3, which states "*Do you think that the information about the author's name or the article's source can influence oneself, friends and others*" (*source*). The participants potentially understand the effect of the provision of the source of

Table 5
Factors that predict influence of the Web Third-person phenomenon on the self by order of severity for *users online*, *online article* and *social*.

Sample	Self vs others	Percentage (%)
User online (N = 3661)	Education, perceived expertise, age, monthly income, hours spend online, how often they are online and gender	81.3
Online article (N = 3163)	Perceived expertise, education, age, monthly income, hours spend online, how often they are online and gender	80.65
Social (N = 4588)	Education, perceived expertise, age, monthly income, hours spend online, how often they are online and gender	71.1

Note: mean ratings 1, 2, 4 and 5. Higher numbers indicating more agreement with the question.

an article as one of a positive connotation and therefore, they accept a degree of influence as well. Such an explanation is further corroborated by the positive correlation observed between the source and the perceived influence of the source to self and others ($r = .278$; $p < .0001$ and $r = -.119$; $p < .0001$). This means that when someone observes the source of the article, the perceived influence on himself increases and the WTPE decreases.

The media that shared the questionnaire is considered to be credible by users participating in the study, a fact that can be anticipated from google page rank, alexa rank and from the number of followers and friends that they have in social networks. The more credible the news is perceived to be, the narrower the gap between the effect of them on others and oneself (Sutcliffe & Namoun, 2012). This also may be a reason why the WTPE on H3 was not significant. It has to be noted that the specific question did not contain a single story and context. Consequently, the users answered that the source of an article influences all people to the same extent. As it is confirmed by the theory, if there was a particular controversial or negative mediated message, (including controversial news reports, advertisements, pornography and violence) the perceived effect of such messages on others relative to oneself would be stronger and the WTPE would exist. The absence of WTPE in H3 may assume to confirm the pattern that was stated in other studies (Brosius & Engel, 1996; Chapin, 2002; Eveland, Nathanson, Detenber, & McLeod, 1999; Gunther & Mundy, 1993; Henriksen & Flora, 1999; Hoffner et al., 1999; Huh, Delorme, & Reid, 2004; Lo & Wei, 2002; McLeod, Eveland, & Nathanson, 1997; Salwen & Driscoll, 1997; Wei & Lo, 2007; Youn, Faber, & Shah, 2000). H4 is represented by the question "*When you read an article on a website and notice that many users have posted it on facebook, twitter, or other social networks do you believe that this information can affect, yourself, friends and others*" (*social*). There were statistically significant differences with the self being less influenced ($X = 2.28$; $SD = 1.14$) compared to friends ($X = 2.74$; $SD = 1.03$) and others ($X = 3.06$; $SD = 1.07$). The effect size is 0.24 explaining approximately 24% of the variability. In agreement with previous studies, it has been claimed that the users get influenced by social media metrics (number of shares and comments) in shaping an opinion, based on what the other users perceive about media influence (Stavrositu & Kim, 2014). However, this study concludes that WTPE can also be found in social media metrics, when there are no single stories and contexts. Furthermore, it was proved that it is valid in every web media generally, except blogs, which were not tested in this study.

Our study found that age (Boster & Mongeau, 1984; Meyrick, 2001; Pechmann, Zhao, Goldberg, & Reibling, 2003; Tiedge, Silverblatt, Havice, & Rosenfeld, 1991) has statistically significant effects on WTPE and that explains the existence of WTPE for H1, H2 and H4. Regarding the partial impact, it was proven that in the H1, younger users (10–20) exhibited lower WTPE, compared to all other age groups ($p < .0001$, for all comparisons). In the H2, the two younger age groups (10–20 & 21–30) exhibited less WTPE compared to the older age groups ($p < .0001$ for all comparisons). Finally, as far as the H4 concerns the younger age groups (10–20, 21–30 & 31–40) displayed less WTPE effect compared to the older age groups ($p < .0001$ for all comparisons). Also, the factor of age is significantly correlated to the effect on self and others in the H1, H2 and H4 variables in a negative direction. Generally, biased perception of media influence relate to how individuals estimate and perceive the potential impact on themselves *or* others. However, another, often used, way to measure and theorize about Third-person perceptions is to focus on the difference between the two perceptions. The latter way is perhaps a more accurate way of tapping the magnitude of the third person bias. Consequently, for the present study there are two ways to understand the results of the relationship between age and WTPE: one can focus on the correlational data (that describe the degree of covariance between age and WTPE) and the analyses of variance (that further extent our understanding of this relationship by showing the dependence of WTPE on age). First, age is negatively correlated with perceived influence on self and others, as it is evident for *"user online" "article online"* and *"social"* variables. Hence, the older the participants, the less the perceived influence is oneself and others. On the other hand, by looking at the repeated measures data, one can see that the difference between perceived influence oneself and on others tends to increase as the age increases as well. Hence, the magnitude of WTPE seems to increase with age. Of course, all ages perceived influence on others to be greater than on themselves, verifying the classical third person perception. Correlational data suggest that as age increases, individuals show a bias, perhaps favoring their self-esteem or based on their increased experiences, and exhibit a perception of decreasing influence on themselves. At the same time, data from the analyses of variance suggest that this bias finds its way in the comparative perceptions of media influence, where the magnitude of third person perceptions increases with age. Therefore both correlational and ANOVA results underlie the importance of age as an anchor for understanding the WTPE phenomenon. Overall, these data contribute to our understanding of biased perception of media influence since it underlies the importance of age to both the process of biased perception, as well as the magnitude of this bias.

The prediction of influence on users from the WTPE was extracted via classification models with high discrimination performances and more specifically, *user online* (81.3%), *online article* (*80.65%*) and *social* (71.1%). After implementing an evaluation analysis, the vector of input variables was identical for the first two technical characteristics regarding the significance hierarchy (education, perceived expertise, age, monthly income, hours spend online, how often they are online and gender) and with a slight difference for the third one (perceived expertise, education, age,

Table 6
Summarized results of Web Third-person effect in structural aspects of the information presented on media websites.

Scope and media sources		Grouping structure	Supported WTPE hypotheses	Prediction (%)
Users online	All web media ($N = 9150$)	Self, friends and others	Independency of the message orientation (negative or positive). The number of users online effect the opinion for the media website.	81.3
Online article			Independency of the message orientation (negative or positive). The number of views of an article (post) effects on the opinion for the media website.	80.65
Source			Independency of the message orientation (negative or positive). There was no WTPE appearance, irrelevant of the medium.	No
Social			Independency of the message orientation (negative or positive). The social media metrics (likes and shares) effect on the opinion for the media website.	71.1

monthly income, hours spend online, how often they are online and gender). This means that for the researched questions, users' perceived expertise on internet use is the main factor that can predict the hypothesis and also there is a confirmation that education and age are sufficiently explanatory factors (Boster & Mongeau, 1984; Meyrick, 2001; Pechmann, Zhao, Goldberg, & Reibling, 2003; Tiedge, Silverblatt, Havice, & Rosenfeld, 1991).

Table 6 summarizes the results and conclusions from the conducted research. In order to refer into a unified presentation, the fields are the same as in Table 1, which presented previous relative research in the field of WTPE. It has to be noted that the scope and media sources column is expanded, aiming to include all the investigated factors and hypothesis.

6.1. Limitations and future research

This online study was conducted having many age differentiations in the formulated groups, while retaining relevant locality (Greeks). Another controlled experiment with the same age groups, may be conducted only in a computer laboratory with a single story and a specific context, providing more results and conclusions about the effect. Furthermore, one main future objective for the study extension could be the elaboration of the survey in other countries with the same or additional integrated factors. Finally, another aim would be to conduct a research on applications for tablets and smartphones and examine the degree of influence on oneself and others related to mediated messages.

7. Conclusion

The current work has investigated Web Third-person effect hypothesis for user generated information or content and for all the types of media websites (television stations, radio stations, newspapers, portals and social media). The findings of this study suggest that the number of users being concurrently online on the same media website, the exact number of users having read each article on a website, as well as the number of users having posted it on a news article on facebook, twitter, or other social networks are perceived to have a greater impact on others or our friends than ourselves. Furthermore, WTPE can also stand in social media metrics when there are no single stories and contexts. Web Third-person effect hypothesis was proven in these three cases across all news media (tv station, radio station, newspaper, portal and email-social media), where users can be influenced by these messages. Moreover, age was found as a significant factor that explains the findings and plays an important role to the WTPE. Factors that predict the influence that specific web media messages have on users and the tendency they have to believe that they are less influenced by these messages than others (WTPE) were found in this study. The implicated factors for the conducted survey and experiments were the education, the users' perceived expertise of the internet use, the age, the monthly income, the hours spend online, how often they are online and the gender provided high predictive ability, while their evaluation ranking shows sufficient resemblance, indicating the formulation of a pattern in the saliency of the proposed input characteristics. Finally, the information about the author's name or the article's sources on a media website is the most important factor according to the users' answers. The users consider the source of an online article to be important to themselves, friends and others and they are all affected to the same extent. It seems that participants understood the potential effect of the provision of the source of an article as one of a positive indication and therefore they accept a degree of influence by it. Such an explanation is supported by the positive correlation that was observed between the source and the perceived influence of the source to self and others. Additionally, when the news is perceived to be credible and there is not a particular mediated message, WTPE is absent. It is also assured that when there is a negative or controversial mediated message, then WTPE appears, confirming the existing theory and extending it for all web media (except blogs which have not been researched). Since the TPE relies on internal psychological aspects and mechanisms, the analysis of the current research is focused on investigating and modeling the crucial user's metrics and factors that affect their behavior and attitudes, while interacting with media websites. In this context, the aforementioned results tried to meet the user's expectations by attempting to quantify a generalized mediated message regarding the media content.

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