HEALTHY NUTRITION 2.0 IN SPAIN: HEALTHY EDUCATION AND CONTROL OF MISINFORMATION

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Abstract— Healthy nutrition companies and organizations are increasingly using the Internet to deliver health information; however, little is known about use web 2.0 as a source of nutritional information. In web 2.0 each user has their own individualized profile that businesses learn through cookies and data mining. Thus, this situation forces us to consider the impact that this technology could have on healthy nutritional attitudes of users and the importance given to perceived control to avoid nutritional misinformation. This research analyzes the above relationships in Spain. For this purpose 345 valid questionnaires corresponding to social networking users were obtained. A personal survey with a structured questionnaire (non-probability convenience sampling) was used. EQS was used to test the proposed model. The findings have demonstrated that a higher perceived usefulness in healthy nutritional education and greater user control over nutritional information defines a better social networking attitude and a strengthening of the intended use of healthy nutritional in web 2.0.

Keywords— Attitude, Control, Healthy nutrition, Intention of using web 2.0, Nutritional misinformation, perceived usefulness, social networking.

I. INTRODUCTION

Healthy nutrition companies and organizations are increasingly using the Internet to deliver healthy nutritional information [1]; however, little is known about use web 2.0 as a source of nutritional information [2].

The evolution of the internet towards web 2.0 came with the arrival of a new generation of interactive online technologies. These applications allowed the easy publishing, editing and distribution of nutritional content [3], as well as the creation of different social networks and online nutritional communities [4]. From a marketing standpoint, this web 2.0 allows for the creation of special healthy nutritional advertising message which could be distributed through advanced digital technology. The semantic encoding of the message might include information not present at first sight to the user [5]

In this sense, web 2.0 technologies have been implemented and used at a small-scale in healthy nutrition companies and institutions to build and achieve more efficient data customization. These data, which are obtained through social media, social networks and other collaborative services like Flickr, Delicious, Digg, extract the preferences, nutritional habits and the users' profiles on the relevant network. The Web 2.0 is allowing businesses the interactive use of data and offering nutritional content with presence on all networks and accessibility from all devices (iPhone, iPad, etc) [6].

Indeed, with basically internet technology, consumers would have to do a lot of independent searches to find the best information for diets low in saturated fat and diets increasing fruit and vegetable, cross-reference the results with their preferences, and finally decide which would be most appropriate [7]. Throughout the process, it would be perfectly feasible to visit two or three healthy education sites to compare and spend much time looking through results in various search sites

However, in the web 2.0 it would be as if the consumer had a personal assistant who would know almost everything about the user and could access all the nutritional information available online to answer any questions. Thus, and according to some Internet experts [6], the web 2.0 will be able to do all the work described above using a single search. From a software agent, into which personal tastes are introduced, an advanced search service can be used where the parameters of the search are indicated and outlined, to then collect, analyze, and present data to whom made the comparison, in an instant [8]. This is feasible because in the web 2.0, each user will have their own individualized profile based on their searching and browsing history. This means that if two different people use the same service and perform an Internet search with the same

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health keywords, each receive different results determined by their individual profiles [6]

This situation forces us to consider the good impact that this technology could have on healthy nutrition attitudes of users and on the importance given to perceived control to avoid misinformation. In this sense, the results are different if consumers assume that usefulness of health education is predominant and perceived the control that companies have to avoid misinformation in order to protect health, or on the contrary, consumers understand that healthy nutrition is not important.

Therefore, the aim is twofold in this paper: (i) measure healthy nutrition 2.0 in Spain (perceived usefulness of nutritional education and perceived control to avoid misinformation); and (ii) test the relationship between social networking that improve healthy nutritional attitude and the intended use of web 2.0. In this context, the managerial implications are important since numerous possibilities to marketing and contextual communication are opened up.

The work has been divided into three parts. Firstly, proposing a conceptual model integrating selected theories (TRA, TAM, TPB, C-TAM-TPB), totally or partially. Secondly, describing the methodology used in the research design. And finally, presenting the results and contrast the previously raised hypotheses, as well as drawing conclusions, with all the limitations that research entails. Also, some managerial implications and future research guidelines have been suggested.

II.   HEALTHY NUTRITION 2.0

A. Background of perceived usefulness of healthy education and perceived control to avoid misinformation

Regarding perceived usefulness of healthy education in web 2.0, the literature has confirmed a significant relationship between perceived usefulness and social networking attitude of users [9]. This research focuses on a context where the ultimate goal of using 2.0 technologies is to increase consumer nutritional education by facilitating the necessary interaction not only with other members of the network but also with the health company through its social network profile [10]. All of that will lead to perceive usefulness and thus a proactive and positive healthy consumer attitude in order to facilitate the change nutritional habits [11]. According to the above, we can state the following hypothesis

H1: The greater the perceived usefulness in healthy education, the better social networking users' attitude.

Regarding perceived control to avoid misinformation, in recent times, the spread of use of web 2.0 services is having important negative consequences. By one hand, social networking are allowing indiscriminate access of personal blogs with misleading information that can cause health damage [1] and by other hand, health companies are indexing private data that make up the digital profile of users without the knowledge and consent of these users [12].

In this context, users want to be sure that true healthy nutritional information will be found in web 2.0. If not, the possible health damage caused by misleading information would put at risk the future viability of nutritional social networks and user confidence in digital technologies [13]. According to the above, we can state the following hypothesis:

H2: The greater company control over true nutritional information, the better social networking users' attitude

B. Consequences of the social networking users' attitude: Strengthening the intention of using the web 2.0

The relationship between social networking attitude and the intended use of web 2.0 is crucial to the behavioral models in virtual environments (TAM and TPB theories). The effectiveness of this relationship has been demonstrated by various researchers [4] in different contexts. In this sense, we have determined the existence of a positive relationship between attitude of the digital consumer and future behavioral intentions and use the web 2.0 [14]

If social networking attitude to web 2.0 is positive, the intended use of nutritional web 2.0 will be strengthened. This allows us to state the following hypotehesis:

H3: A positive social networking users' attitude produces a strengthening of the intended use of nutritional web 2.0.

III.   RESEARCH METHODOLOGY

A. Profile of the sample

To learn about healthy nutrition in a web 2.0, an empirical study was conducted via a personal survey with a structured questionnaire. The collection of data yielded 345 valid questionnaires in the end (non-probability convenience sampling). The profile of the sample were individuals older than 14 years living in Spain who claimed to participate (be registered or be users) of at least one social network. In Tables 1 and 2 respectively the demographic profile of the sample and its main features as users of social networks can be observed.

Table 1: Sociodemographic profile of the Sample

Characteristics	%
Genre	
Man	41,4
Woman	**58,6**
Completed studies	
Primary	2,6
Secondary	22,6
University	**69,3**
Postgraduate (Master/Doctorate)	5,5
Age	
Under 20 years old	12,8

From 21 to 25 years old	**59,1**
From 26 to 30 years old	10,1
From 31 to 40 years old	7,2
41 and over	10,8
Occupation	
Unemployed	**49,6**
Works Occasionally	22,6
Works Part Time	12,7
Works Full Time	15,1
Home income (average reference 1800 €)	
Far below average	5,2
Below average	18,6
Average	**20,3**
Above average	**38.8**
Far above average	17.1

Table 2: Characteristics of the sample

Characteristics	%
Since when do you participate in web 2.0?	
Less than 6 months	2,6
From 6 to 12 months	5,5
From 1 to 2 years	**33,2**
From 2 to 3 years	**38,4**
From 3 to 5 years	17,1
More than 5 years	3,2
Frequency of connection to the web with semantic tools	
More than 2 times a day	**53,3**
One or two times a day	24,5
Many times a week	9,7
Once a week	7,3
Once a month	3,2
With less frequency	2,0
Time online	
Less than half hour a day	28,3
Between half hour to one hour a day	**46,5**
Between 1 and 2 hours a day	21,0
Between 2 and 3 hours a day	7,1
More than 3 hours a day	4,2

B. Measuring instrument properties

For the measurement of the variables under study, those scales most commonly used in the literature (Venkatesh & Morris , 2000; Taylor & Todd, 1995; Moom & Kim (2001) have been relied on, adapting the wording of the items to the characteristics of healthy nutrition social networks and using Likert 5 point type questions. Following the methodological recommendations, a confirmatory factor analysis using EQS was conducted, which allowed confirming that the measurement tools used were adequate for research here.

Note that after modifying the scales, they were able to obtain adequate indicators of goodness of fit of the measurement model and the calculated indicators to confirm its psychometric properties (Table 3). Reliability of the scales used to measure the constructs was confirmed. As evidence of convergent validity , the AFC results indicate that the loads of all the items are significant on its predicted factor (p < 0.01) and their mean is, in almost all cases, greater than 0.7 [15].

Finally, it was established that the measurement model demonstrate discriminante validity. For this, first the corresponding confidence intervals were calculated and they found that the correlations between the factors were significantly lower than one. Secondly, it was found that the variance extracted from each construct were superior to the square of the correlation between this construct and any other. These conditions were met for each of the factors, noting that the model does not raise discriminant validity problems (Table 4).

Table 3. Psychometric properties of the scales

FACTOR	INDICATOR	ST LOAD	T VALUE. Robust	α	CR	AVE
Perceived usefulness of healthy education	Utired1	0.910**	24.243	0.925	0.928	0.764
	Utired2	0.833**	21.379			
	Utired3	0.897**	25.778			
	Utired4	0.855**	24.737			
Perceived control to avoid misinformation	Conper1	0.964**	19.656	0.973	0.973	0.923
	Conper2	0.971**	19.204			
	Conper3	0.948**	19.129			
Social networking attitude	Actired1	0.933**	19.744	0.973	0.973	0.878
	Actired2	0.928**	18.729			
	Actired3	0.949**	20.306			
	Actired4	0.937**	20.340			
	Actired5	0.940**	20.631			
Intended use of nutritional web 2.0	Intuso1	0.935**	20.541	0.938	0.941	0.843
	Intuso2	0.945**	22.034			
	Intudo3	0.873**	20.431			

*p<0.05; **p<0.01;

X^2: 321.4427 (fd: 106); Bentler-Bonett NFI: 0.8; CFI: 0.9; IFI: 0.9; RMSEA: 0.65

Table 4: Discriminant Validity

	F1	F2	F3	F4
F1	0.764	[0.720-0.820]	[0.846-0.906]	[0.810-0.886]
F2	0.492	0.923	[0.889-0.933]	[0.832-0.896]
F3	0.562	0.529	0.878	[0.901-0.921]
F4	0.519	0.446	0.629	0.843

NOTE: The diagonal represents the average extracted variance AVE. The variance shared by each pair of factors is above the diagonal (correlation squared). Below diagonal the confidence interval of 95% for estimation of the correlation between factors.

F1-UTIRED = Perceived usefulness of healthy education, F2-CONPER = Perceived control to avoid misinformation, F3-ACTIRED= Users' Attitude towards nutritional web 2.0, F4-INTUSO= Intended use of nutritional web 2.0

IV. RESULTS

Having evaluated the properties of the measuring instrument, we proceeded to estimate, also using EQS, a structural model in which the relationships raised are summarized in Figure 1.

For this, the same approach previously mentioned was used, to determine the significance of the parameters. Table 5 presents the values of the standardized coefficients of the structural relationships and their respective levels of significance of the t statistic associated. As can be seen, the background (perceived usefulness of healthy education and perceived control to avoid misinformation) perfectly explains the social networking users' attitude and in the same way, the relationship of social networking users' attitude and the intended use of nutritional web 2.0 is confirmed.

Therefore, data analysis allowed us to estimate the proposed model. Indeed, it has been demonstrated that a higher perceived usefulness of healthy education determines a better social networking users' attitude, confirming H1. In this regard, it has also been found that more perceived control over nutritional information defines a better social networking users' attitude, confirming H2. Finally, it has also been proven that a positive attitude towards web 2.0 produces a strengthening of the intended use of nutritional web 2.0 by the user, confirming H3.
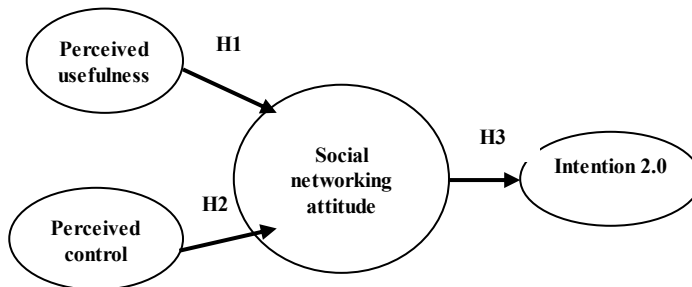
Figure 1: Hypothesized Model

Table 5: Structural equation model. Contrast of relationships

# (HYPOTHESIS)	MEANING	B	T Robust
H1	UTIRED-ACTIRED	0,439**	12,759
H2	CONPER-ACTIRED	0,799**	18,345
H3	ACTIRED-INTUSO	0,920**	25,826
*p<0.05; **			
X2: 344,2381 (df:105); Bentler-Boner: 0,927; BBNN: 0,940; CFI: 0,951; IFI: 0,951; MFI: 0,787; RMSEA: 0,085			

V. CONCLUSIONS

The research conclude that assertive attitude of the users on the functionality that the nutritional web 2.0 can pose for them, gives them increasingly personal solutions (health tips, solutions to questions about diseases, complete nutritional diets, etc…) and this implies a positive and proactive attitude towards social networks [16]. Health companies should incorporate into their healthy web 2.0 specific software that allows manager the nutritional content in the form of databases of health tips, habits and customs of the users and in this way increase the perceived usefulness of healthy nutrition 2.0, while at the same time, the company should incorporate control mechanisms to guarantee true healthy nutritional information.

Regarding managerial implications, nutritional web 2.0 platforms are able to create nutritional content customized [17]. This will lead to a world of ultra-customized information in which there will be a "filter" (health tips depending on our previous network activity) to prioritize what is really relevant to the user and potential customer [18]. What is described above offers endless possibilities for health companies in the field of nutritional marketing and contextual communication [1].

As all researches, the present one has limitations. These will become future research guidelines. Regarding future research, digital development of healthy nutrition 2.0 must be studied not only in Spain but also in others countries, jointly to the impact that this kind of social networks could have in order to change nutritional bad habits [19]

VI.   REFERENCES

[1] Sociedad española de dietética y ciencias de la alimentación, "Una dieta fundamentada en alimentos de origen vegetal, como la mediterránea, protege la mente de caer en la depresión", available in www.nutricion.org, (28-09-2015)

[2] CM. Pollard, CE. Pulker, X. Meng, DA. Kerr and JA. Scott "Who Uses the Internet as a Source of Nutrition and Dietary Information? An Australian Population Perspective", J Med Internet Res, 17(8): 209. 2015;

[3] A. Rahe. "Dietary patterns and the risk of depression in adults: a systematic review of observational studies". *Eur J Nutr*, 53: 997-1013. 2014

[4] P. Anderson, "What is Web 2.0? Ideas, technologies and implications for education". *JISC Technology and Standards Watch*. 1-64. 2007

[5] Cocktail Analysis: "5º Oleada Observatorio de Redes Sociales". (2013) Available in: http://tcanalysis.com/

[6] S. Sanz, C. Ruiz, J. Martí, and A. Hernández, "Motivos de uso de redes sociales móviles: un estudio centrado en los adolescentes españoles". *Jornadas Luso Españolas*, Vila-real, Portugal. 2012

[7] S. Villegas "A longitudinal analysis of diet quality scores and the risk of incident depression in the SUN Project" *BMC Medicine*, 13 (1): 197. 2015

[8] G. Pallis, D. Zeinalipour-Yazti, and MD. Mikaiakos "Online social networks: status and trends". New Directions in Web Data Management, Berlin, Alemania. 2011

[9] K. Heinnonen, "Consumer activity in social media: Managerial approaches to consumers' Social media behavior" *Journal of Consumer Behaviour*, 10, 356–364. 2011.

[10] S. Shang, E. Li, Y. Wu, and O. Hou "Understanding Web 2.0 service models: A knowledge-creating perspective". Information & Management, 48, 178-184. 2011

[11] T. Willis, D. Coovert, C. Nelson, P. Spector, D. Rohrer and T. Shimizu, "*An Evaluation of the Technology Acceptance Model as a Means of Understanding Online Social Networking Behaviour*". Doctoral Thesis, USA. 2008

[12] A. Hernandez and I. Kuster "Brand impact on purchase intention. An approach in social networks channel". *Economic & Business Letters*, *1(*2), 1-9, 2012

[13] KN. Hampton, LS. Goulet, L. Rainie and K. Purcell "Social networking sites and our lives. How people's trust, personal relationships, and civic and political involvement are connected to their use of social networking sites and other

technologies". *Pew Internet Project.* Pew Research Center's Internet & American Life Project. Washintong D.C. 2011

[14] S. Wang and H. Wang, "User acceptance of mobile Internet based on the Unified Theory of Acceptance and Use of Technology: Investigating the determinants and gender differences". *Social Behavior & Personality: An International Journal, 33*(3) 415-426. 2010

[15]J. Hair, R. Anderson, R. Tatham and W. Black. *Multivariate data analysis* (5th ed.): Prentice-Hall. NJ, United States. 1998

[16]A.Oenema, F.Tan, J. Brug, "Short-Term Efficacy of a Web-Based Computer-Tailored Nutrition Intervention: Main Effects and Mediators", Ann Behav Med, *29*(1):54–63) . 2005

[17] S. Mirbagheri "Mobile marketing communication: learning from 45 popular cases for campaign designing". *International Journal of Mobile Marketing. 5*(1) 175-192. 2010

[18] M. Bulearca and S. Bulearca, "Twitter: a Viable Marketing Tool for SMEs?" *Global Business & Management Research, 2*(4), 296-309. 2010

[19] M. González "A provegetarian food pattern and reduction in total mortality in the Prevención con Dieta Mediterránea (PREDIMED) study" *.Am J Clin Nutr*, 100: 320-328. 2014