

Prevendo os fatores que influenciam a motivação e a intenção de recomendar via eWOM: uma investigação profunda com base na análise de RNA

Predicting the drivers that influence motivation and intention to recommend via eWOM: a deep investigation based on the ANN analysis

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Nota de esclarecimento:

O X SINGEP e a 10ª Conferência Internacional do CIK (CYRUS Institute of Knowledge) foram realizados de forma remota, nos dias 26, 27 e 28 de outubro de 2022.

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Prevedo os fatores que influenciam a motivação e a intenção de recomendar via eWOM: uma investigação profunda com base na análise de RNA

Objetivo do estudo

Esta pesquisa tem como objetivo prever os fatores que influenciam a motivação e a intenção de recomendação via eWOM: uma investigação profunda baseada na análise de RNAs de grupos brasileiros de alimentos e bebidas no Facebook, incluindo a interação entre os participantes.

Relevância/originalidade

Dada a importância do tema eWOM nas redes sociais, sendo um dos temas de destaque na área, este estudo colabora com a divulgação do tema e contribui para a ampliação do conhecimento na área.

Metodologia/abordagem

A amostra (n=345) foi composta por participantes de grupos de Comida e Bebida no Facebook. Para a análise dos dados foi utilizado o método não-linear das Redes Neurais Artificiais como forma de prever ocorrências dentro da mesma amostra.

Principais resultados

O estudo pôde confirmar que a qualidade das informações trocadas nos grupos, a reciprocidade, o prazer em ajudar e o sentimento de pertencimento dos participantes são capazes de influenciar na motivação para a realização do eWOM

Contribuições teóricas/metodológicas

Foi proposto um modelo teórico, utilizando escalas adaptadas para o estudo. Com isso, foi realizado um levantamento e, com os resultados obtidos na amostra, foi utilizada uma abordagem do método RNA.

Contribuições sociais/para a gestão

Este estudo ajudar os participantes, administradores, moderadores e demais interessados nos grupos de comida e bebida do Facebook a entender mais sobre os grupos dos quais participam é essencial para entender como se pode aproveitar as informações trocadas nos grupos.

Palavras-chave: eWOM, Motivação, Intenção de Recomendar, Grupos no Facebook, Redes Neurais Artificiais

*Predicting the drivers that influence motivation and intention to recommend via eWOM:
a deep investigation based on the ANN analysis*

Study purpose

This research aims to predict the drivers that influence motivation and intention to recommend via eWOM: a deep investigation based on the ANN analysis of Brazilian food and beverage groups on Facebook, including the interaction between participants.

Relevance / originality

Given the importance of the eWOM theme in social networks, being one of the prominent themes in the area, this study collaborates with the dissemination of the theme and contributes to the expansion of knowledge in the area.

Methodology / approach

The sample (n=345) consisted of participants from Food and Drink groups on Facebook. For data analysis, the non-linear method of Artificial Neural Networks was used as a way of predicting occurrences within the same sample.

Main results

The study was able to confirm that the quality of the information exchanged in the groups, the reciprocity, the pleasure in helping and the sense of belonging of the participants are able to influence the motivation to carry out eWOM.

Theoretical / methodological contributions

A theoretical model was proposed, using scales adapted for the study. With that, a survey was carried out and, with the results obtained in the sample, an approach of the ANN method was used.

Social / management contributions

This study help participants, administrators, moderators and others interested in Facebook food and drink groups to understand more about the groups they participate is essential to understand how it can take advantage of the information exchanged in the groups.

Keywords: eWOM, Motivation, Intention to recommend, Groups on Facebook, Artificial Neural Networks

1. Introduction

With the advancement of technology and the spread of the internet, the online environment has become an unlimited space for communication, making it possible to connect with people from all over the world, anytime and anywhere. With this, users join virtual communities to exchange information, experiences, and ideas and discuss topics of common interest, all quickly and easily (Pi et al., 2013; Tobon & Garcia-Madariaga, 2021).

In this sense, virtual communities are characterized by the online gathering of individuals who frequently interact, communicate, and exchange information of common interest (Fisher, 2019). It is a new form of association, no longer based on close ties, but on cooperation and exchange of information, knowledge, and collective interests, with the possibility of expanding their networks, even if deprived of physical contact between the participating individuals, branch easily, be transitory and independent of time and space.

Virtual communities stand out for bringing together people, probably unknown, who come together for a common goal or interest, with the possibility of forming online social groups. Such groups can be formed on social networks such as Facebook, Twitter, or Instagram (Guidi et al., 2020).

As the third most used social network, Facebook has 130 million users, most of whom access the network through their cell phones (We are social & Hootsuite, 2021). One of the widely used features of the platform is groups, which users can create to discuss anything of common interest to the people who participate. As in the offline world, individuals participate in groups for various reasons, such as meeting people online, looking for jobs, sharing common hobbies, and buying and selling products (Guidi et al., 2020).

Previous research has analyzed that the social media sharing culture is the most significant factor that promotes the willingness of Facebook Group users to share knowledge (Moser et al., 2017; Pi et al., 2013). In addition, it was found that users' perception is that for purchases and sales, groups are easy to use, convenient, and more reliable than other online buying and selling platforms.

Thus, when participating in a particular group, members effectively feel part of it and share a common goal with others (Pi et al., 2013), in addition to feeling satisfied and wanting to share information about the group with other acquaintances, including inviting them to participate, or even with other users on social networks, which can be seen as an eWOM recommendation from the groups. In a simplified way, eWOM – “electronic Word of Mouth” – is communication between consumers sharing experiences about a particular product, brand, or service online (Hennig-Thurau et al., 2004) will be discussed in more detail below.

In this sense, studies have sought to identify the motivations for carrying out the eWOM (Cheung & Lee, 2012; Hennig-Thurau et al., 2004; Hussain et al., 2017; Jeong & Jang, 2011; Sundaram et al., 1998), how online recommendation mechanisms promote the transmission and reception of opinions through eWOM (Pinochet et al., 2019). These factors influence eWOM behavior via social networks (Zhang et al., 2017) and, more specifically, the motivations for carrying out eWOM on Facebook (Serra & Soto-Sanfiel, 2014) and its consequent influence on consumer purchase intention (Erkan & Evans, 2016; Kudeshia & Kumar, 2017).

In short, considering the growing use of social networks, the importance of Facebook as one of the most used and the relevance of food and drink groups on Facebook, in addition to the importance of the eWOM theme in social networks (Donthu et al., 2021) and the lack of more specific studies on the intention to recommend via eWOM of Facebook groups, it is

necessary to develop studies that involve the significant dimensions for the intention to recommend via eWOM of food and drink groups on Facebook.

This research aims to predict the drivers that influence motivation and recommendation intention via eWOM: a deep investigation based on the ANN analysis of Brazilian food and beverage groups on Facebook, including the interaction between participants. The present work has the specific objectives of proposing a theoretical model that makes it possible to understand the intention to recommend via eWOM among the participants of food and drink groups on Facebook and to identify which of the factors - information quality (Chang et al., 2017; Chen & Cheng, 2009; Chi, 2018; Shah et al., 2020), reciprocity (Carvalho, 2015; Kankanhalli et al., 2005; Wasko & Faraj, 2005), pleasure to help (Carvalho, 2015; Wasko & Faraj, 2005)) and sense of belonging (Algesheimer et al., 2005; Carvalho, 2015; Ellison & Boyd, 2008) – is the most significant in leading to eWOM motivation and intention to recommend via eWOM.

2 Theoretical Foundation

2.1 Electronic Word of Mouth (eWOM)

With the development of new technologies and the spread of the internet, social networks have established themselves as a widely used means of communication, even changing how people search, compare, and buy products and services. In this context, the old practice of recommending and talking about product returns among consumers with the popularization of social networks, emerging as a virtual version of word-of-mouth marketing (Hussain et al., 2017; Rosario et al., 2020; Serra & Soto-Sanfiel, 2014).

Therefore, online, consumers can either engage in positive eWOM when they have a positive experience with the product/service or company and share it with others or perform negative eWOM when they have an unsatisfactory experience and express negative opinions and complaints (Zhang et al., 2017). Even when there is no direct intention to recommend, any consumer opinion or online behavior regarding a product/service or company can be considered eWOM (Rosario et al., 2020).

Given the large amount of information online, the user must filter what suits him since the anonymity of the internet can generate uncertainties about that source, representing a limitation on the credibility of eWOM information (Luo et al., 2013). Therefore, the influence of eWOM depends on the characteristics of the information, such as quality, credibility, usefulness, and consumer behavior about information, such as the need for information (Erkan & Evans, 2016).

Unlike traditional word-of-mouth communication or Word of Mouth (WOM) can easily gain large dimensions and spread quickly, and can happen in different ways, in different channels, and reach different people at different times. In addition, when placed on the internet, information can be available indefinitely and be easily accessed by several users (Cheung & Thadani, 2012). Thus, when eWOM occurs through social networks, it is classified as social eWOM, in which a user's recommendation or opinion can influence friends, acquaintances, or potential consumers in that network (Kudeshia & Kumar, 2017).

2.2 Food and Drink Groups on Facebook

The creation of groups is one of the resources offered by Facebook to its users, making it possible to interact and share information with people who have common interests in a private space, different from what occurs in the common sharing of the social network (Pi et al., 2013).

Groups can be created by any Facebook user, who will be given the role of administrator of the group, being able to manage their settings. These can be configured in two privacy options, namely: public, when anyone on or off Facebook can see what members post, comment, and share in the group, or private, when only members can see posts, comments, and shares in the group. When set to private, admins can also select whether the group will be visible or hidden, e.g., whether anyone will be able to find the group or whether only group members will be able to find it in search and elsewhere on Facebook (Guidi et al. al., 2020).

This research focuses on groups categorized as Food and Drink, where users get together to interact, exchange different experiences, share memes, and promote products and everything related to food or drinks, including specific groups for different interests within this category.

3 Conception of the theoretical model for application in artificial neural networks

This section presents the proposed theoretical model (Figure 1), developed from the theory described in the following subsections and the formulation of the research hypotheses listed in their respective constructs. To seek answers for this research, we developed a structural model containing the constructs we adapted for this context. The seminal references followed the corresponding scales: information quality (Chang et al., 2017; Chen & Cheng, 2009; Chi, 2018; Shah et al., 2020), reciprocity (Carvalho, 2015; Kankanhalli et al., 2005; Wasko & Faraj, 2005), pleasure for helping (Carvalho, 2015; Wasko & Faraj, 2005), sense of belonging (Algesheimer et al., 2005; Carvalho, 2015; Ellison & Boyd, 2008), eWOM motivation (Hennig- Thurau et al., 2004; Jeong & Jang, 2011; Sundaram et al., 1998) and intention to recommend via eWOM (Chiang, 2018; Chiang et al., 2017).

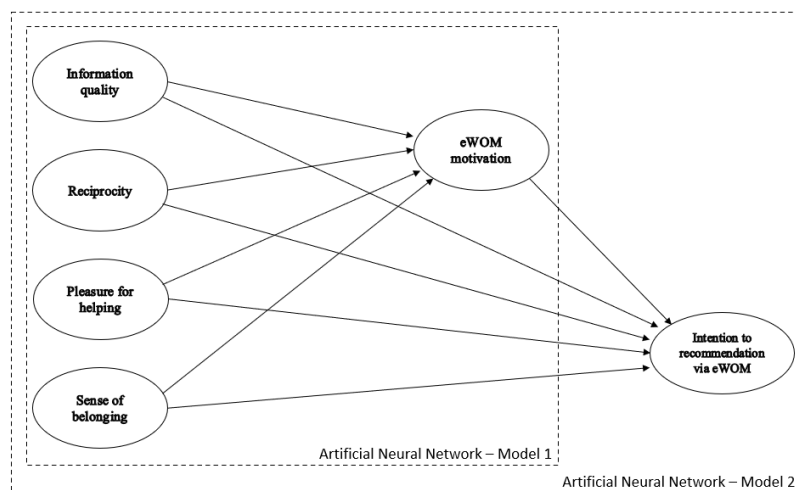


Figure 1: Theoretical model.

3.1 Information quality (IQ)

The information quality refers to the completeness, personalization, relevance, security, and comprehensibility of the content made available to those who consume it (Chi, 2018). Through the availability of accurate, current, complete, timely, and understandable information in the online environment, the quality of information can interfere with users' choices, making it possible to compare products or services, take better advantage of purchases, and choose the best one's options (Chang et al., 2017; Shah et al., 2020).

Therefore, by using this scale, recent studies have sought to understand whether the quality of information is a determining factor in the perception of usefulness and ease of use of shopping sites through mobile devices (Chi, 2018), in addition to analyzing whether the perception The overall quality of a website affects purchase intention (Chang et al., 2017) and confirm that the quality of eWOM information is positively related to the usefulness of eWOM information, being one of the key factors influencing consumer purchase intention (Erkan & Evans, 2016).

Therefore, the concept of information quality is placed as one of the dimensions of the quality of the service performed by the groups, considering that, in various ways, what the groups have to offer is mainly summarized in information. Thus, it is observed in the literature that service quality influences consumer involvement in eWOM behavior (Fine et al., 2017).

3.2 Reciprocity (RE)

Reciprocity is an intrinsic motivation of the individual to respond to a behavior that can be either positive when rewarding those who were kind to us or harmful when punishing those who were mean to us (Caliendo et al., 2012).

Individuals maintain an ongoing exchange, giving back what they receive from others based on a mutual sense of obligation. In this way, when there is strong reciprocity in a community, a continuous contribution is ensured, as individuals believe that their efforts to contribute knowledge will be rewarded when they need it (Wasko & Faraj, 2005).

Previous studies have observed that reciprocity is one of the main reasons for carrying out positive eWOM and a significant motivator for the contribution of knowledge when there is no obligation to cooperate, through group rules, for example (Carvalho, 2015; Kankanhalli et al., 2005). It has also been previously observed that reciprocity influences recommending behavior in social networks. On the other hand, it is observed that reciprocity does not have a significant direct relationship with the consumer's intention to perform eWOM (Cheung & Lee, 2012; Gharib et al., 2020).

3.3 Pleasure for helping (PH)

The pleasure of helping is related to altruism when people feel good about helping others and do not expect anything in return. Therefore, the pleasure in helping felt by individuals makes them more likely to contribute, for example, with their knowledge (Kankanhalli et al., 2005).

Part of this is also because individuals with this motivation believe that knowledge is something that should be shared, in addition to being aware that at some point in the past, someone helped them by sharing knowledge when they needed it, so this concept relates to reciprocity (Wasko & Faraj, 2005).

Likewise, in online communities, the pleasure of helping lies in the personal satisfaction of helping others by sharing their knowledge. It can even be seen as one of the benefits of contributing information online and one of the reasons behind eWOM communication. (Cheung & Lee, 2012).

Thus, when using this scale, studies found that the pleasure of helping directly influences eWOM, being fundamental for its propagation, either to help other consumers make decisions or to spare them from negative experiences, which also makes it one of the reasons for promoting negative WOM (Alexandrov et al., 2013; Cheung & Lee, 2012). Furthermore, it was found that the pleasure of helping other consumers directly influences the motivation to get involved in eWOM (Carvalho, 2015).

3.4 Sense of belonging (SB)

The sense of belonging is related to emotional involvement with a group, where the individual identifies as part of a community and shares common goals with others (Cheung & Lee, 2012). Thus, when identifying with the community, the individual shares a collective identity and becomes emotionally involved with it, a fact that implies an affective commitment to the group, in addition to agreeing with the norms, traditions, objectives and committing to promote their well-being (Algesheimer et al., 2005).

Likewise, the sense of belonging in social networks occurs when the user gets involved and feels like part of an online community or group, effectively participating in it and communicating with other users (Chai & Kim, 2012). In general, in Facebook groups, there is a strong sense of belonging among members since they are formed by users with common interests who can share information in their own private space (Pi et al., 2013).

Thus, previous studies suggest that the sense of belonging is significantly related to the intention to perform eWOM (Cheung & Lee, 2012), being one of the main reasons for performing positive eWOM (Carvalho, 2015). In addition, it was found that the sense of belonging positively impacts the behavior of contributing knowledge in social networks (Chai & Kim, 2012).

3.5 eWOM motivation (MO)

The eWOM is characterized by the exchange of experiences, whether positive or negative, regarding a product, service, brand, or company, differing from WOM for essentially taking place on the internet. Given the dimension of the virtual environment and the possibility of remaining anonymous, the question is raised about what would motivate individuals who do not know each other to help each other by sharing information and opinions online, without guarantee of receiving something in return (Killian et al., 2016).

Given the proximity in the concepts of WOM and eWOM, one can consider the motivations to generate WOM applicable to eWOM. According to a previous study, it is possible to identify the main motivations for eWOM as concern for other consumers, expressing positive feelings, social benefits, and economic incentives. (Hennig-Thurau et al., 2004).

Similarly, other studies have found that the main motivations for positive eWOM are altruism, involvement with the product, and the search for self-improvement, in addition to concern for other consumers, desire to express positive feelings, and willingness to help the company (Jeong & Jang, 2011; Sundaram et al., 1998).

However, it is observed that some of these motivations can be seen as both positive and negative, for example, the individual may be motivated by his altruism to carry out positive eWOM and help other consumers by sharing their good experience with a specific service (Hu & Kim, 2018).

3.6 Intention to recommend via eWOM (IR)

eWOM communication refers to any statement made in the online environment regarding a product, service, or company, which can be either positive or negative. These recommendations turn experienced individuals into reliable and influential sources of information, encouraging those still in the decision-making process (Chiang et al., 2017; Hennig-Thurau et al., 2004).

Thus, consumers try to influence the purchase decision of friends, acquaintances, and other potential consumers through their online recommendations, facilitating this decision process and, at the same time, helping the company in its sales (Kudeshia & Kumar, 2017). On

the other hand, before making a purchase decision, consumers tend to seek online sources of recommendation, either through comments or experience reports, preferring information from sources that are considered more experienced (Yang, 2013).

In addition, consumers should filter the information present in the recommendation considering its quality, whether it is only persuasive, speaking superficially about the product/service and being convincing about their opinion, or if it is complete, providing sufficient details and information (Luo et al., 2013).

Furthermore, as observed in previous studies, recommending to others reduces the tension caused by the consumption experience, allows the person to gain attention from others, shows knowledge, suggests status, suggests possession of privileged information, and asserts superiority. In this sense, it is suggested that individuals with higher self-esteem are more likely to share experiences and be confident to suggest or recommend something to others (Chiang et al., 2017; Hennig-Thurau et al., 2004).

4 Methodological Aspects of Research

4.1 Data collection and sample

In the Food and Drink category on Facebook, Brazilian groups carried out a survey. It was established that the interest of this research group in which members constantly interact by asking or sharing recipes, asking for directions, or recommending restaurants, products, or services related to food and drink, and posting feedback, both positive and negative, from restaurants, food, and beverage-related products or services. In addition, everyone was asked to participate, depending on the approval of administrators and moderators. Some criteria were established to discard groups outside the scope of this research, keeping only those that best fit the study theme.

The data were obtained conveniently, and for the collection process, a questionnaire published on the online research platform QuestionPro was used and disseminated to the groups selected for the research. Of the participants, 369 completed the survey and, after data purification, using the Mahalanobis Distance criterion (D^2) to identify outliers ($n=24$), 345 respondents remained. Thus, for the 'post hoc' test, a sample of 345 individuals were considered, with an effect size equal to 0.15, $p<0.05$, and 5 predictors. The result was an f^2 equal to 2.24 and the sampling power ($1-\beta$ err prob) of 99.99%. For this study, a pre-test with 20 individuals (included in the total sample) was carried out to verify the understanding of the research instrument. After the pre-test, it was not necessary to adjust the research instrument. Finally, as no data was missing, it was unnecessary to use an imputation method. For data analysis, the IBM SPSS software was used.

4.2 Instrument development

A questionnaire was elaborated with assertions of several scales, adapting them for the study. The research has a sociodemographic portion of the respondent's profile and psychometric scales of the proposed model. The model was built with 33 questions anchored on a five-point Likert-type scale (1- "I totally disagree", 2- "Partially disagree", 3- "Neutral", 4- "Partially agree", and 5- "I agree" totally). However, in the model adjustment phase (exploratory factor analysis was used), 6 items were excluded (IQ1, IQ3, RE1, SB4, SB6, and SB7), totaling 27 assertions. Next, we performed the importance analysis with the support of the Artificial Neural Networks (ANN) method.

4.3 Artificial Neural Networks

This study uses an approach with Artificial Neural Networks (ANN) method. Since the MEE captures only linear relationships, the ANN method was used to identify both linear and non-linear relationships, in addition to learning from training (Leong et al., 2020; Liébana-Cabanillas et al., 2017). Thus, using an ANN approach proves to be advantageous in taking advantage of nonlinearity in predictive models.

As with previous research (Chan & Chong, 2012; Chong & Bai, 2014; Leong et al., 2013; Liébana-Cabanillas et al., 2017), the ANN model determines the relative importance of each independent variable of the model. Two ANN models were proposed based on the model, presented as examples in Figures 2 and 3.

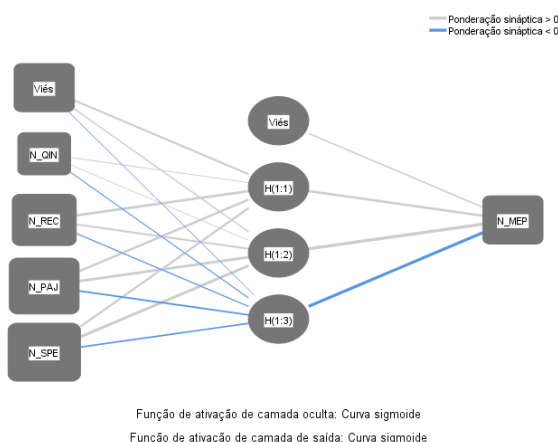


Figure 2: Neural Model 1

Source: Output from IBM SPSS software.

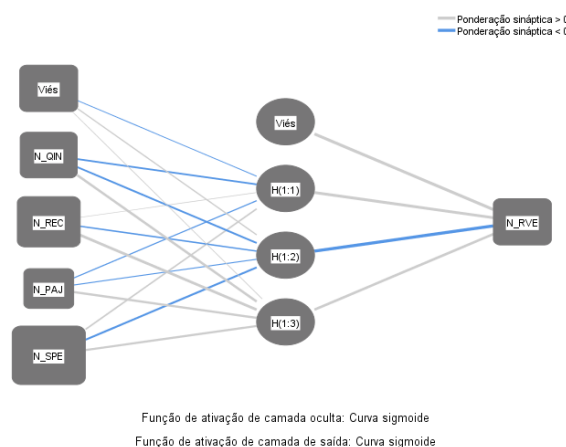


Figure 3: Neural Model 2

Source: Output from IBM SPSS software.

In the ANN 1 model, the covariates are the four independent variables of the model (IQ, RE, PH, and SB), while the dependent variable is the eWOM motivation (MO). In the ANN 2 model, the four independent variables were maintained, but the intention to recommend via eWOM (RVE) was used as the dependent variable.

The multilayer perceptron training algorithm (MPTA) was used to train the neural networks. The PMC had five independent variables imputed (IQ, RE, PH, PH, and MEP), 3 hidden layers (automatically calculated by software generally the number of hidden layers represents 2/3 of the number of imputed variables), and an output layer, which would be the dependent variable – intention to recommend via eWOM (IR). Thus, the averages of the items of each variable (\bar{v}_i), the items were normalized $[0, 1]$ by the expression: $\bar{x}_i = \frac{\bar{v}_i - 1}{4}$.

The sigmoid curve function was used to activate the output layer and the hidden layer, since this is a good way to model non-linear behaviors, as it assumes values between 0 (non-activation) and 1 (activation). The Root Mean Square Error (RMSE) -, calculated based on the expressions below, was used to measure the model's accuracy. $SSE = \sum_{t=1}^n (Q_t - \hat{Q}_t)^2$ and $RMSE = \sqrt{\frac{SSE}{n}}$, where Q_t are the observed data (Q) in time t , \hat{Q}_t is the predicted value at time t and n is the amount of data.

5 Results

5.1 Characterization of respondents

The sociodemographic circumstances of the sample are detailed in gender, age, education, income, and marital status. It is observed that most of the 345 respondents in the sample, 93.62% (n=323), are female. The results show that 44.35% (n=153) of respondents are between 18 and 25 years old. Regarding schooling, 28.12% (n=97) are studying for a degree, while about income, most of the sample, 69.86% (n=241), declares to have an income lower than R\$4,400.00 (US\$835.85). Finally, 58.84% (n=203) of the respondents declared their marital status as single.

In the variables income and marital status, regardless of gender, the concentration of responses is in what was contemplated by most of the total sample. Therefore, it was also observed that for both groups, male (50%) and female (44%), the age is concentrated between 18 and 25 years. As for schooling, most men are attending graduation (45.5%), and most women are studying (26.9%) or have already completed graduation (23.2%).

Likewise, it is observed that access experience ($t_{(343)}=0.820$; $p=0.413$) and mastery of technological resources ($t_{(343)}=0.302$; $p=0.763$) related to Facebook groups are independent of gender. As well as, the fact of working or not in the food and beverage segment ($t_{(343)}=0.177$; $p=0.860$) and the fact of participating in these groups encourage participants to undertake in the area ($t_{(343)}=1.139$; $p=0.255$).

On the other hand, when we compare access to food and drink groups in the pre-COVID-19 pandemic period with the current moment, we notice that male respondents report a greater increase ($t_{(343)}=2.309$; $p=0.022$).

In addition, it was found that most respondents were aware of the research through the group “Group where we pretend to be Jacquin” (82.6%), followed by the group “Share your FOOD” (8.1%) and the “Air Fryer, I Love You!” (4.9%).

Also, the main motivations that lead users to participate in food and drink groups on Facebook were analyzed, making it possible for participants to choose more than one option. In addition, the main reasons identified are seeking entertainment (29.7%), wanting to learn new recipes and techniques (26.4%), getting product/service recommendations (17%), and interacting with people with similar interests (15.5%).

Given this, it is observed that entertainment is one of the main reasons for participating in groups of this category, being exemplified in Figure 4 through a publication extracted from one of the groups selected for the research, where there is a joke about people who eat lots of cake at parties. Entertainment in groups is related to various publications, for example, memes, humor videos, in-group jokes, and photos of attempts to cook something that went wrong.

Next is the desire to learn new recipes and techniques, which refers to publications sharing a recipe or a new way of using equipment, for example, as exemplified in Figure 5, where the user shares the bread recipe he made in an electric fryer.

Another point to note is that getting recommendations is one of the main reasons users participate in groups, ranking third. In most groups, it is possible to see publications asking for recommendations of a specific type of food, product, or restaurant, such as places that sell frozen foods, vegan restaurants, best hamburgers, or where to find candy for parties. The example below, Figure 6, demonstrates a publication where a user requests a recommendation of good sweets and puts messages to give someone a birthday present.



Figure 4: Example of group food and beverage entertainment.



Figure 5: Example of group food and beverage recipe sharing.



Figure 6: Example requesting group food and beverage recommendation.

5.2 Measurement by Artificial Neural Networks

Ten-fold cross-validation was performed for each model, using 90% of the data as training, with an estimation set used to train the neural network and the other 10% as a test to measure the accuracy of the trained network, which should comprise 10% to 25% of the sample (Chong & Bai, 2014; Leong et al., 2020; Zabukovšek et al., 2019). Tables 1 and 2 show the RMSE values for each model show the respective graphs with the RMSE values.

The mean of model 1 RMSE values for training is 0.080, while for testing, it is 0.081. In model 2, for training, it is 0.108, and for testing, it is 0.122. Therefore, based on the low values of RMSE, it can be concluded that network models are reliable in capturing the numerical relationships between the predictors and the output (Leong et al., 2013; Liébana-Cabanillas et al., 2017; Ooi & Tan, 2016; Zabukovšek et al., 2019).

Table 1: RMSE values for the ANN1 model

Training			Test			Total samples
n	SSE	RMSE	n	SSE	RMSE	
306	1.816	0.077	39	0.210	0.073	345
312	2.315	0.086	33	0.269	0.090	345
312	1.838	0.077	33	0.290	0.094	345
307	1.815	0.077	38	0.343	0.095	345
302	1.994	0.081	43	0.203	0.069	345
314	1.834	0.076	31	0.159	0.072	345
305	1.864	0.078	40	0.271	0.082	345
311	1.750	0.075	34	0.243	0.085	345
305	2.181	0.085	40	0.242	0.078	345
308	2.163	0.084	37	0.187	0.071	345
Average	1.957	0.080	Average	0.242	0.081	
Standard deviation	0.195	0.004	Standard deviation	0.054	0.010	

Source: own elaboration.

Table 2: RMSE values for the ANN2 model

Treining			Test			Total samples
n	SSE	RMSE	n	SSE	RMSE	
311	3.839	0.111	34	0.461	0.116	345
305	3.418	0.106	40	0.490	0.111	345
308	3.438	0.106	37	0.549	0.122	345
299	3.737	0.112	46	0.721	0.125	345
316	3.519	0.106	29	0.483	0.129	345
308	3.838	0.112	37	0.681	0.136	345
302	3.585	0.109	43	0.475	0.105	345
316	3.377	0.103	29	0.646	0.149	345
301	3.456	0.107	44	0.574	0.114	345
307	3.506	0.107	38	0.447	0.108	345
Average	3.571	0.108	Average	0.553	0.122	
Standard deviation	0.173	0.003	Standard deviation	0.099	0.014	

Source: own elaboration.

Sensitivity analysis performance was calculated by averaging the importance of the covariates in predicting the output for the ten networks, as shown in Tables 3 and 4. Predictor importance measures how much the predicted value of the network model changes for different values of the predictors. The importance values were divided by the highest importance value and presented as a percentage to calculate the normalized importance values.

Table 3: Sensitivity analysis for the ANN model 1

Artificial Neural Network (ANN)	IQ	RE	PH	SB
ANN (I)	0.117	0.147	0.433	0.304
ANN (II)	0.068	0.239	0.326	0.366
ANN (III)	0.115	0.170	0.435	0.280
ANN (IV)	0.129	0.179	0.452	0.240
ANN (V)	0.207	0.066	0.449	0.278
ANN (VI)	0.116	0.148	0.440	0.297
ANN (VII)	0.101	0.115	0.481	0.304
ANN (VIII)	0.103	0.125	0.483	0.289
ANN (IX)	0.036	0.040	0.466	0.459
ANN (X)	0.112	0.079	0.512	0.297
Average importance	0.110	0.131	0.448	0.311
Normalized importance (%)	24.7	29.2	100.0	69.6

Source: own elaboration.

Neural networks can capture non-collinear relationships between information quality, reciprocity, pleasure for helping, feeling of belonging, and motivation for eWOM, as well as between the model's independent variables and recommendation intention via eWOM. Based on model 1 reviews, pleasure for helping ($\bar{x}_{PH} = 44,8\%$) is the most important predictor for eWOM motivation, followed by sense of belonging ($\bar{x}_{SB} = 31,1\%$), reciprocity ($\bar{x}_{RE} = 13,1\%$) and information quality ($\bar{x}_{IQ} = 11,0\%$). While, based on the analysis of model 2, the sense of

belonging ($\bar{x}_{SB} = 42,7\%$), is the most important for the intention to recommend via eWOM, followed by the pleasure for helping ($\bar{x}_{PH} = 22,6\%$), information quality ($\bar{x}_{IQ} = 19,2\%$) and reciprocity ($\bar{x}_{RE} = 15,5\%$).

Tabela 4: Sensitivity analysis for the ANN model 2

Artificial Neural Network (ANN)	IQ	RE	PH	SB
ANN (I)	0.199	0.280	0.099	0.422
ANN (II)	0.205	0.121	0.207	0.467
ANN (III)	0.151	0.133	0.249	0.467
ANN (IV)	0.234	0.232	0.247	0.287
ANN (V)	0.188	0.149	0.245	0.418
ANN (VI)	0.280	0.160	0.265	0.295
ANN (VII)	0.138	0.116	0.230	0.516
ANN (VIII)	0.184	0.097	0.256	0.463
ANN (IX)	0.195	0.097	0.249	0.460
ANN (X)	0.150	0.162	0.215	0.474
Average importance	0.192	0.155	0.226	0.427
Normalized importance (%)	45.1	36.2	53.0	100.0

Source: own elaboration.

6 Discussion of Results

In this study, t-test and ANOVA analyzes were performed to understand the interaction of the 'information quality' construct with the sample population. Thus, age was considered as a clustering variable to verify if there was any relationship with the 'information quality'. After an ANOVA, it was observed that the group 'from 18 to 25 years old' had a higher average, which is explained by the fact that it is a more critical generation in relation to food and drink contents ($F_{(3, 341)}=3.974$; $p= 0.008$; Tukey's test indicates that the difference is at $\bar{x}_{\text{from 18 to 25 years old}} = 3.54$; $s = 0.75$).

It was also observed that more experienced users in accessing Facebook groups have a better perception of quality ($t_{(343)}=2.772$; $p=0.006$), which can be explained by the fact that more experienced users in accessing are more used to deal with the flow of information in the groups, managing to filter and better locate what is really interesting for them.

Thus, through the analyzes to understand the interaction of the 'reciprocity' construct with the sample population, it was observed that, when the sex variable is related to the reciprocity construct, there is no difference between the male and female groups ($t_{(343)}=1.116$; $p=0.265$), showing that both are reciprocal in the same intensity. Furthermore, it was observed that users who are more experienced in accessing Facebook groups are more reciprocal ($t_{(343)}=2.837$; $p=0.005$), as are users who consider themselves to master technological resources related to Facebook groups ($t_{(343)}= 2.248$; $p=0.025$).

People who work in the food and beverage segment were also more reciprocal ($t_{(343)}=2.798$; $p=0.005$), this can be explained considering that it is in the interest of this category of participants that the others have all the information necessary, especially with regard to something they sell.

The construct ‘pleasure for helping’ proved to be important in the analysis of neural networks, being the most important independent variable for the motivation for eWOM. This result can be understood by the fact that the ‘pleasure for helping’ is one of the most significant factors for eWOM motivation, as identified in the literature (Carvalho, 2015). The attitude of helping other group members arises from the inherent altruism of the individual, who is motivated to share information with no expectation of receiving anything in return and feels good about it.

Thus, in the analyzes performed between the construct ‘pleasure for helping’ with the sample population, it was observed that men and women have a similar level of ‘pleasure for helping’ ($t_{(343)}=1.260$; $p=0.209$). In addition, it was observed that users who are more experienced in accessing Facebook groups ($t_{(343)}=4.586$; $p<0.001$) and who consider mastering technological resources related to Facebook groups are more happy to help ($t_{(343)}= 5.341$; $p<0.001$), which can be justified by the fact that these users have a greater habit, due to experience, and ease of doing so, due to the domain of technological resources.

In the analysis of neural networks, the sense of belonging presented the highest degree of importance for the intention to recommend via eWOM of the groups. This can be explained by the sense of belonging that generates satisfaction in the participants, which makes it propitious to recommend and speak well of something they feel they are a part of group.

Thus, the interactions of the ‘sense of belonging’ construct with the sample population were analyzed. When related to the gender variable, it was found that the respondents of the female group had a greater ‘sense of belonging’ ($t_{(343)}=2.202$; $p=0.028$) in relation to the male group. In addition, more experienced users in accessing Facebook groups have a greater ‘sense of belonging’ ($t_{(343)}=3.512$; $p=0.001$).

It was also found that, as the number of groups that the user participates in grows, the ‘sense of belonging’ construct significantly increases, that is, the greater the number of groups that the user participates, the greater the sense of belonging ($F_{(3, 341)}=3.356$; $p=0.019$; Tukey’s test indicates that the difference is in $\bar{x}_{6 \text{ or more}} = 3.81$; $s = 0.80$).

Likewise, it is observed that as the number of groups that the user participates increases, in addition to verifying the growth of the ‘motivation for eWOM’ and the ‘intention to recommended via eWOM’. Therefore, the greater the number of groups that the user participates, the greater the ‘eWOM motivation’ ($F_{(3, 341)}=2.654$; $p=0.049$; Tukey’s test indicates that the difference is in $\bar{x}_{6 \text{ ou mais}} = 3.93$; $s = 0.90$ and the ‘intention to recommended via eWOM’ ($F_{(3, 341)}=3,643$; $p=0,013$; Tukey’s test indicates that the difference is in $\bar{x}_{6 \text{ or more}} = 3.69$; $s = 0.99$).

7 Conclusions

7.1 Theoretical implications

The present study aimed to predict the drivers that influence motivation and recommendation intention via eWOM: a deep investigation based on the ANN analysis of Brazilian food and beverage groups on Facebook, including the interaction between participants. Therefore, a theoretical model was proposed, using scales adapted for the study. With that, a survey was carried out and, with the results obtained in the sample, an approach of the ANN method was used.

Thus, the study was able to confirm that the quality of the information exchanged in the groups, the reciprocity, the pleasure in helping and the sense of belonging of the participants are able to influence the motivation to carry out eWOM of food and drink groups on Facebook.

In addition to confirming that the quality of information, the sense of belonging and the motivation to perform eWOM are able to influence the practice of recommending via eWOM.

It is also noteworthy, as research finding, that the motivation to perform eWOM played an important role in mediating the relationships between reciprocity and the intention to recommend via eWOM and the pleasure in helping and the intention to recommend via eWOM.

Given the importance of the eWOM theme in social networks, being one of the prominent themes in the area (Donthu et al., 2021), this study collaborates with the dissemination of the theme and contributes to the expansion of knowledge in the area. Another contribution of this study is to bring, in an adapted way, the scales developed in other areas (e.g.: hospitality), making the interpretation more complex. In addition, the lack of more specific studies on the intention to recommend via eWOM of Facebook groups is filled, given that previous studies observed only the sharing of knowledge in Facebook groups (Pi et al., 2013) and the eWOM recommendation. on Facebook in general (Kudeshia & Kumar, 2017).

7.2 Practical implications

The results of this study help participants, administrators, moderators and others interested in Facebook food and drink groups to understand more about the groups they participate. It is essential for group administrators and moderators to understand what factors lead participants to recommend the group, as this can serve as a basis for improvement. Thus, the group can grow and even be monetized, serving as a dissemination channel or expanding with content to other networks, such as Instagram or TikTok, for example.

In addition, this study is essential for Facebook, as a company, to understand how it can take advantage of the information exchanged in the groups, even to improve the user experience on the platform (Naujoks & Benkenstein, 2020). Other than that, companies in general must understand the relevance of groups, given the amount of information that is exchanged about them in this environment. As noted in the study by Kim and Johnson (2016), the UGC related to a company can influence other consumers. Therefore, it is extremely important that companies recognize and monitor the eWOM carried out in the groups, being present when necessary (Tobon & Garcia-Madariaga, 2021). In addition, through the information obtained in the groups, companies can outline strategies to improve points highlighted by consumers (Erkan & Evans, 2016).

7.3 Limitations and suggestions for future research

Among the limitations observed in this study, the access to the groups and their members stands out, since many do not accept the dissemination of research such as this one, due to the guidelines established by the administrators of the groups, in addition to the difficulty of being able to get in touch with the administrators. and moderators.

It is also important to highlight that another limitation is the predominance of the female audience, representing 93.62% of the sample. This may occur because Facebook groups are mostly formed by female members or because they seem to be more willing to participate in research on the subject, hypotheses that could be tested in future research. Finally, it would be interesting to analyze the trends for Facebook groups, including considering the context of the metaverse, paying attention to how the migration of groups to this environment would be and how the eWOM recommendation would be given.

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