Customer experience with farmers' markets: what hashtags can reveal

RESEARCH ARTICLE

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Abstract

Social media networks are increasing in popularity and have been integrated into many aspects of daily life. Analysis of the ways in which individuals use social media is important for understanding social, cultural, and environmental issues. This study examines experiences of farmers' market customers through their self-expression on social networks. Contributions to the Instagram social network based on the #farmersmarket hashtag were gathered on a single day, yielding 19,398 contributions created by 13,862 users. Six major linked hashtags were identified (#Organic, #Fresh, #Food, #Local, #Vegan, and #Healthy), providing key indicators of the characteristics of farmers' markets that are valued by customers. Four customer segments were identified: Product Oriented, Emotional Oriented, Social Oriented, and Product-Social Oriented, with strong interconnections identified between these communities. The results of this study provide insights into consumer values and behaviors in the farmers' market context and will be of practical use for future marketing and management.

Keywords: farmers' market, Instagram, customer experience, farmers' market values
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1. Introduction

Farmers' markets have experienced increased popularity in recent years, particularly in industrialized countries (Gallardo *et al.,* 2015). This retail model, in which consumers purchase food directly from producers, is thought to provide several economic and social benefits (Pascucci *et al.,* 2011; Varner and Otto 2007). Consumers consider several complex factors when sourcing food (Terblanche, 2018) and can obtain food products perceived to be of high quality via farmers' markets (Besik and Nagurney, 2017). Purchasers assess food quality not only by objective characteristics such as price (Gosadi *et al.,* 2016; Marian *et al.,* 2014) and labelling (Nikolaou *et al.,* 2017), but also by factors related to higher personal needs (Pilař *et al.,* 2016), including food safety (Scarpa and Thiene 2011), environmental impact (Beckford *et al.,* 2011), and support for local (Brown *et al.,* 2009; Gumirakiza *et al.,* 2016) and rural (Conner *et al.*, 2010) communities; other ethical aspects also play a role (Migliore *et al.,* 2015). As a result, emotional factors strongly influence purchasing decisions (Terblanche, 2018; Walsh *et al.,* 2017).

Increasing levels of globalization, reflected in the growing internationalization of corporations (Knight and Liesch, 2016), have negative effects on small and medium enterprises in several business sectors (Bijaoui, 2017). Large food producers primarily focus on mass production and profit maximization (Migliore *et al.,* 2015). This is in direct contrast with many small rural family farms (Kessous *et al.,* 2016), which tend to focus on high quality production (Poláková *et al.,* 2015), sustainable development (Vaarst *et al.,* 2015), environmental stability (Caracciolo and Lombardi, 2012; Migliore *et al.,* 2015), and vertical integration (Balmann *et al.,* 2006). Therefore, it is not surprising that small farmers are changing their business strategies to maintain their market position in the face of increasing competition (Weltin *et al.,* 2017).

Understanding customer experience is important when devising appropriate marketing strategies to increase the competitiveness of farmers' markets (Conner *et al.,* 2009). Social media networks play important roles in everyday life (Matyjas, 2015), and consumers often use these networks proactively to share experiences and to create and share content (Grissemann and Stokburger-Sauer, 2012). This provides researchers with opportunities to analyze large datasets (so called 'Big Data') (Eirinaki *et al.,* 2018) with the aim of understanding customer opinions (Joo *et al.,* 2011). This research aims to extend knowledge of customers' experience of farmer´s markets through analysis of their self-expression on social networks.

We examined Instagram data surrounding the hashtag #farmersmarket with the aim of determining what segments could be identified through hashtag analysis. The results have practical implications for marketing and management of farmers' markets.

2. Literature review

2.1 The significance of farmers' markets for consumers and farmers

Farmers' markets play a critical role in rebuilding local and regional food systems (Gillespie *et al.,* 2008). Customers at farmers' markets have high expectations regarding food quality (Besik and Nagurney, 2017; Gumirakiza and Curtis, 2013; Mack and Tong, 2015; Mejía and García-Díazb, 2017) and the social (Baker *et al.,* 2009; Kirwan, 2006; Spilkova *et al.,* 2013), ethical (Johnston *et al.,* 2012), and environmental aspects of production (Leiper and Clarke-Sather, 2017). These aspects are compatible with 'social values' and farmers (Knutson, 2017), in addition to their role as food producers, can be considered as social entrepreneurs (Liang *et al.,* 2017). Social entrepreneurship creates social value by addressing social problems and social needs through mobilization of interpersonal and professional networks (Witkamp *et al.*, 2011). Furthermore, social enterprises contribute to the creation of social networks through their promotion of collaborations with other actors to disseminate the created social value (Dufays and Huybrechts, 2014). At farmers' markets, consumers can meet producers/farmers (Spiller, 2012) and the purchase can be made directly or indirectly through market vendors (Carson *et al.,* 2016). Basic products sold at farmers' markets include agricultural and horticultural products such as fruit, vegetables, flowers, and eggs, and added-value products such as

bakery and dairy products (Govindasamy *et al.,* 2002). The ability of farmers' markets to meet the needs of consumers interested in social values and local support has led to their expansion in recent years (Pokorná *et al.,* 2015). Consumer concerns regarding nutrition, health, societal well-being, and local communities can be assuaged by purchase of fresh, local, organic products at farmers' markets (Pokorná *et al.,* 2015).

Through their participation in alternative food networks, farmers play important roles in maintaining high quality food production (Liu *et al.,* 2013), conserving the environment, and promoting individual and community well-being (Migliore *et al.,* 2015). Customer acknowledgment of the social value provided by farmers is important in the maintenance of farm businesses and their market positions (Kirwan *et al.,* 2013). In the Czech Republic, individual farms tend to produce their goods within small- or medium-sized enterprises. These businesses often outperform larger food producers, possibly as a result of farm subsidies, better production strategies, or lower costs (Hyblova, 2014). Small- to medium-sized enterprises tend to increase their profit by changing distribution strategies and adapting business models accordingly (Cleveland *et al.,* 2014; Massa and Testa, 2011). These strategies include continuing to supply the market through intermediaries such as wholesalers, retailers, co-operatives, distributors, and auctions, while also exploiting alternative outlets such as farmers' markets, farm shops, farmer co-operative shops, and farm-to-school programs (Izumi *et al.,* 2010; Meynard *et al.,* 2017), all of which have the potential to contribute to farm growth and produce increased profit. A major driver of participation in farmers' markets is thus to add value to food production at the farm level (FAO, 2016).

2.2 The context of social networks

The widespread popularity of social media (Muntinga, 2016) and integration of social media into daily interactions (Osterrieder, 2013) has changed the way in which customers interact with producers. Consumers no longer receive messages in a passive manner, but instead respond actively to messages and act as co-creators of networked communications (Malthouse *et al.,* 2013). In 2017, the global population of social network users was approximately 2.46 billion, and the estimated number of current users is 3.02 billion (Statista, 2017a). This substantial resource presents opportunities for researchers and marketers to analyze communications between users to maintain competitiveness and understand customer needs (He *et al.,* 2013; Mucan and Özeltürkay, 2014; Peters *et al.,* 2013; Ribarsky *et al.,* 2014; Singh *et al.,* 2017). Social media content that has been proactively created by social network users provides a unique resource that allows customer opinions to be accessed directly. Co-created content can enable discussion and promote engagement, and may lead to reciprocal responses from the communication partner (Walsh *et al.,* 2013), thereby increasing marketing value (Braojos-Gomez *et al.,* 2015; Kim and Ko, 2012; Öztamur and Karakadılar, 2014).

Social media use and prevalence is growing across a range of platforms. Integration of social media with everyday activities is illustrated by the fastest growing worldwide social network, Instagram, a mobile image- and video-sharing application with greater than 700 million users (Statista, 2017b). On a daily basis, approximately 95 million images are added to Instagram, and 4.2 million are 'liked' (Aslam, 2017; Statista, 2017b). Recent studies indicate that network users spend more time on Instagram than on other sites (Duggan, 2015), and that Instagram usage is prevalent among young adults: 59% of 18-29 year olds use Instagram, as do 33% of Internet users between the ages of 30 and 49. Furthermore, 71% of U.S. businesses used Instagram in 2017 and 65% of top-performing Instagram posts featured products, highlighting the marketing value of this application (Aslam, 2017; Statista, 2017b). Recent research has examined some of the factors underlying the strong growth of social media. Studies involving Facebook, Twitter, and YouTube identified gratification as a major driver of user interactions on social networks (Chen, 2011; Hanson and Haridakis, 2008; Krause *et al.,* 2014; Mull and Lee, 2014; Smock *et al.,* 2011). Studies of Instagram users identified narcissism (Sheldon and Bryant, 2016), self-presentation, and self-esteem (Back *et al.,* 2010; Chua and Chang, 2016; Herring and Kapidzic, 2015; Lyu, 2016) as important factors.

One of the message-specific characteristics used in social networks is the hashtag, which is the term used for a word or phrase tagged with the character '#'. Hashtags serve as expressions of attitudinal stances and fulfil

important interpersonal functions (Zappavigna, 2012). Previous studies found that users employed hashtags when visiting farmers' markets in order to provide information and share their experiences with others (Pilař *et al.,* 2017). Other studies on the classification of hashtag usage identified categories such as opinion- and emotion-related information (Upadhyay and Upadhyay, 2017) and projection identification (Giaxoglou, 2017), indicating that hashtags fulfilled user needs to express emotions, opinions, and identification through social networks.

2.3 Knowledge gap

The importance of the social aspects of farmers' markets, as well as their value in providing food products, is explored in the research cited above. However, previous studies also indicate that further research is needed to enhance understanding of purchasing behavior, such as analysis of customer experience (Lucan *et al.,* 2015) and analysis of segmented customer cohorts (McNeill and Hale, 2016). Previous studies gathered information regarding customer experiences mainly through questionnaire surveys (Brown *et al.,* 2009; Chen and Scott, 2014; Mack and Tong, 2015; Pokorná *et al.,* 2015; Sadler, 2016; Scarpa and Thiene 2011). By contrast, this study analyzes hashtag usage to understand the opinions and experiences of social network users. Hashtag use is associated with experiences that social media users find valuable and wish to share through their networks. Analysis of hashtags offers an opportunity to understand groups of users and their shared values. By applying this analysis to farmers' markets, the knowledge gap between the social media and farmers' market trends is bridged.

In this study, Social Media Analytics and Social Network Analysis were used to analyze hashtags used on the Instagram network with the aim of extracting common segments to allow vendors at farmers' markets to better understand their customers. This analysis will be useful for future marketing activities and management of customer relationships, and the methods employed are broadly applicable across fields.

3. Materials and methods

Communications made using the Instagram social network were gathered using the Visual Tagnet Explorer script (2016) on 03/05/2016. Within this period 19,398 contributions containing the #farmersmarket hashtag were created by 13,862 users. The hashtag #farmersmarket was chosen over similar alternatives such as #farmersmarkets and #farmermarket on the basis of its more frequent usage by Instagram users. Data were analyzed using Gephi 0.9.1 software.

Two analysis methods were used: Social Media Analytics and Social Network Analysis. The aim of Social Network Analysis is to understand the structure of networks by examining the connections between single points (nodes; hashtags in this study) and their mutual dependencies using: (1) metrics, which characterize the network at the level of single points and/or at the level of the whole network; (2) graphical network visualizations; and (3) community detection (Combe *et al.,* 2010; Kim and Hastak, 2018; Oliveira and Gama, 2012). The aim of Social Media Analytics is to collect, monitor, analyze, summarize, and visualize social media data to extract useful patterns and intelligence (Zeng *et al.,* 2010). This analysis is useful for product design-development, product innovation, product utilization, brand engagement, competitive intelligence, and general marketing (Fan and Gordon, 2014). In this analysis, hashtags act as nodes and connections act as edges (Figure 1).

The statistics calculated for Social Network Analysis were average degree, graph density, modularity, component analysis, and eigenvector centrality. The average degree of a graph is calculated, as the average number of edges associated with a node (Carrington *et al.,* 2005) as follows, where E is the number of edges and N is the number of nodes:

$$\langle k \rangle = \frac{2E}{N} \tag{1}$$
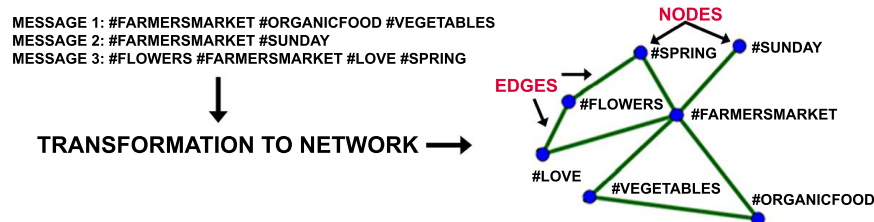
Figure 1. Transformation of data from Visual Tagnet Explorer script to Hashtag Network.

Graph density is defined as the number of edges divided by the number of possible edges (Scott, 2000) as follows, where E is the number of edges and N is the number of nodes:

$$D = \frac{2\,(E - N + 1)}{N\,(N - 3) + 2} \tag{2}$$

Modularity measures network division into modules (also termed groups, clusters, or communities). Networks with high modularity have dense connections among the nodes within modules, but sparse connections between nodes in different modules (Knoke and Yang, 2008). Component analysis identifies the number of distinct components in a network found via modularity detection analysis (Blondel *et al.,* 2008). Modularity is calculated as follows, where $\sum_{in}$ is the sum of linkage weights within the community; $\sum_{tot}$ is the sum of the weights of the edges incident to nodes in the community; k_i is the sum of the weights of the edges incident to node i; $k_{i,in}$ is the sum of the weights of the links from i to nodes in the community; and m is the sum of the weights of all the edges in the networks:

$$\Delta Q = \left[\frac{\sum_{in} + 2k_{i,in}}{2m} - \left(\frac{\sum_{tot} + k_i}{2m} \right)^2 \right] - \left[\frac{\sum_{in}}{2m} - \left(\frac{\sum_{tot}}{2m} \right)^2 \right] \tag{3}$$

Eigenvector centrality describes the importance of nodes (hashtags) in a network. The centrality of the peak is proportional to the sum of the centralities of its neighbors. Important peaks are those with many neighbors or with key neighbors. Eigenvector centrality is calculated as follows, where A represents the neighborhood matrix (after editing, x meets the equation Ax=κ1x, where κ1 is its largest own number (i.e. κ is the number where Ax=κx, where x is the vector itself) and λ is the maximum eigenvalue of the matrix A^2):

$$X_i = \frac{1}{\lambda} \sum A_{xj} X_j \tag{4}$$

Force Atlas 2 was used for graphical representation. Methods based on the analysis of visual representations of reduced samples were used to define network crowds and their types (e.g. polarized and tight networks) (Smith *et al.,* 2014). Data from Social Network Analysis were used for Social Media Analysis to examine the relationships between market intelligence and product development.

4. Results

Social Network Analysis of the #farmersmarket hashtag was performed using Visual Tagnet Explorer (2016) and was divided into several stages. First, the entire dataset consisting of 47,531 nodes and 964,131 connections (edges) was examined (Table 1). The average degree of nodes was 40.659; this means that on average a hashtag was used in connection with 40 other hashtags. This refers not only to single user contributions, but to the usage of the hashtag in all contributions. Modularity was low (0.348), indicating that the groups (also termed communities or crowds) were not polarized. The number of communities was very high (354) and it was necessary to exclude nodes of small degree from further analysis.

The hashtags used most frequently alongside #farmersmarket were: #Organic, #Fresh, #Food, #Local, #Vegan, and #Healthy; therefore, these were selected for further analysis. The importance of these hashtags

Table 1. Characteristics of networks based on the hashtag #farmersmarket.

Characteristics	Original network	Filtered network[1]
Nodes (hashtags)	47,531	6,295
Edges (connections between hashtags)	964,131	373,822
Average degree of hashtags	40.569	118.768
Graph density	0.001	0.019
Modularity	0.348	0.221
Number of communities	354	8

[1] Nodes with a degree higher than 47.

was confirmed by their eigenvector centrality values, which indicated that these hashtags were associated with other high scoring nodes (Table 2). The highest eigenvector centrality was identified for the #organic hashtag. This indicated a high level of association between contributions related to farmers' markets and the term 'organic'. The #Organic hashtag was also found in the most important community (Table 4).

The initial analysis considered the whole dataset. Next, a filter for removing lower degree hashtags was used to more precisely define the communities. Nodes with a degree lower than 47=1% were excluded from the basic set of nodes (47,531), reducing the dataset to 6,295 nodes. This large reduction in nodes suggested that many hashtags were in use that were not widely adopted and used by Instagram users (Table 1). Network characteristics after filtering showed an increase in average degree from 40.659 to 118.768, indicating that small communities involving specific local hashtags that were not used globally were removed. The graph density value increased from 0.001 to 0.019, suggesting a higher level of interconnection between individual hashtags. The level of modularity dropped to 0.221, suggesting that interconnections between individual hashtags within a community were similar to the interconnections with hashtags outside the community and that polarized communities were not present in the filtered dataset.

Degree distribution corresponded with the long tail characteristic (Kordumova *et al.,* 2016). Only 79 hashtags had a degree greater than 1,000. Most hashtags exhibited degrees in the 47-500 range, consistent with standard social network behavior with respect to hashtag usage (Kordumova *et al.,* 2016) (Table 3).

Table 2. Top hashtags connected to #farmersmarket.

Hashtags	Community number	Community orientation	Eigenvector centrality	Degree
#Organic	1	Product	0.769	9,124
#Fresh	4	Social-product	0.669	6,191
#Food	4	Social-product	0.667	6,062
#Local	3	Social	0.635	5,856
#Vegan	1	Product	0.632	5,643
#Healthy	1	Product	0.629	5,410

Table 3. Degree distribution of hashtags within the filtered #farmersmarket hashtag Instagram network.

Degree range	Number of nodes	Percentage
>1000	79	1.25
500-1000	147	2.33
47-500	6,069	96.42

Community definition was repeated with the filtered dataset, revealing eight communities. Of these, four strong communities accounted for 94.56% of the hashtags (Table 4).

Using eigenvector centralities, the five most important hashtags were assigned to each of the four main communities (Table 5). The importance of related hashtags can be determined using degree and eigenvector centrality values. The #Organic hashtag had the highest eigenvector centrality (0.769), with the lowest value recorded for #Strawberries (0.422).

Community 1 was associated with the following five main hashtags: #Organic, #Vegan, #Healthy, #Fruit, and #Vegetarian. These hashtags had a degree range of 3,190-9,124 and eigenvector centrality values of 0.496-0.769. This community, which accounted for 30.39% of the filtered dataset, was termed 'Product Oriented'. Users in the Product Oriented community focused on product characteristics through use of nouns denoting specific products (#Fruit) and hashtags referring to dietary choices (#Vegan, #Vegetarian) or dietary descriptors (#Healthy). This community differed from the other communities as its members used hashtags directly related to relating food products and their characteristics.

Community 2 was associated with a different set of five hashtags: #Flowers, #Love, #Summer, #Strawberries, and #Spring. These hashtags had a degree range of 2,573-4,084 and eigenvector centrality values in the range 0.422-0.540. Community 2, which was associated with 17.72% of the filtered dataset, was denoted 'Emotionally Oriented'. The use of hashtags linked to emotional values associated with visits to farmers' markets, such as the visiting season (#Spring, #Summer), emotions (#Love), or products associated with positive feelings (Pilař *et al.,* 2016), such as #Flowers or #Strawberries, was typical for this community.

Table 4. Communities in the Instagram network related to the #farmersmarket hashtag.

Communities	Main hashtags within communities	Percentage
Community 1: Product	organic, vegan, healthy, fruit, vegetarian	30.39
Community 2: Emotional	flowers, love, summer, strawberries, spring	17.73
Community 3: Social	farmersmarket, local, shoplocal, buylocal, supportlocal	19.92
Community 4: Social-product	fresh, food, eatlocal, farmtotable, vegetables	26.59
Total		94.56

Table 5. Degree and eigenvector centrality of main hashtags in four communities within the #farmersmarket Instagram network.

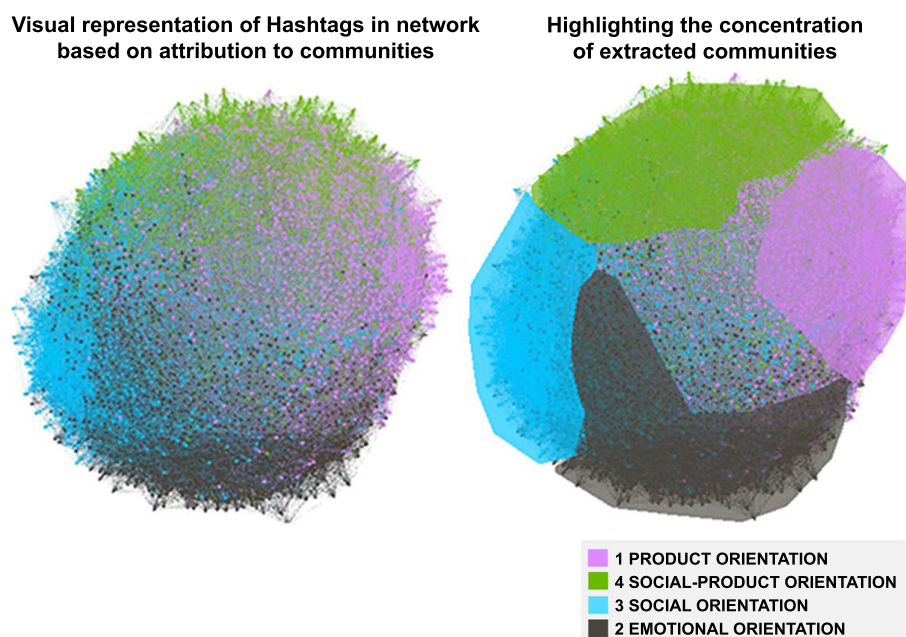| Community	Characteristics of hashtags within a community				
Product orientation	Organic	Vegan	Healthy	Fruit	Vegetarian
Degree	9,124	5,643	5,410	3,705	3,190
Eigenvector centrality	0.769	0.632	0.629	0.541	0.496
Emotional orientation	Flowers	Love	Summer	Strawberries	Spring
Degree	3,621	4,084	3,879	2,598	2,573
Eigenvector centrality	0.467	0.540	0.537	0.422	0.439
Social orientation	Farmersmarket	Local	Shop local	Buy local	Support local
Degree	19,398	5,856	5,338	3,574	3,233
Eigenvector centrality	1	0.635	0.538	0.470	0.456
Social-product orientation	Fresh	Food	Eatlocal	Farmtotable	Vegetables
Degree	6,191	6,062	5,290	3,897	3,246
Eigenvector centrality	0.669	0.667	0.577	0.522	0.495

Community 3 was associated with another group of typical hashtags: #Farmersmarket, #Local, #Shoplocal, #Buylocal, and #Supportlocal. These hashtags had a degree range of 3,233-19,398 and eigenvector centrality values in the range 0.456-1. This community, which accounted for 19.92% of the filtered dataset, was termed 'Socially Oriented' and clearly reflected social awareness of customers and visitors at farmers' markets. Important concerns for this group of users were local support and regional produce.

Community 4 was represented by the hashtags #Fresh, #Food, #Eatlocal, #Farmtotable, and #Vegetables. These hashtags had a degree range of 3,246-6,191 and eigenvector centrality values in the range 0.495-0.669. This community, which accounted for 26.59% of the filtered dataset, was termed 'Social-Product Oriented' because of the combination and focus of the most frequently used hashtags. The Social-Product Oriented group used adjectives and nouns describing products, as in Community 1, as well as an emphasis on local sources (#EatLocal), as in Community 3.

Visual representation of social networks aids understanding of network data and allows network structures to be portrayed. Figure 2 highlights the concentration centers for each community by visualizing hashtags in the network using the Force Atlas 2 algorithm. The modularity value (0.221) and visual representation of the network reveal clear interconnections between the four communities and indicate that they do not form separate entities. Nevertheless, four distinct areas with concentrations of specific community-based hashtags are apparent; therefore, on the basis of their Instagram communications, customers of farmers' markets cannot be considered as a single homogeneous unit.

5. Discussion

This study examined networks associated with the #farmersmarket hashtag, and the findings were consistent with those from previous Social Network Analyses. Social media networks constitute common spaces for the public sharing of knowledge, discussions, debates, and other types of conversation. It is important to map social networks, groups, and communications and document this space, as is usual for other types of large public gathering (Duggan, 2015).

Visual representation of Hashtags in network based on attribution to communities

Highlighting the concentration of extracted communities

1 PRODUCT ORIENTATION
4 SOCIAL-PRODUCT ORIENTATION
3 SOCIAL ORIENTATION
2 EMOTIONAL ORIENTATION

Figure 2. Visual representation of community polarities within a social network related to the #farmersmarket hashtag.

Analysis of the hashtags used most frequently in association with #farmersmarket identified the primary concerns of farmers' market customers: (1) #Organic, (2) #Fresh, (3) #Local, (4) #Vegan, and (5) #Healthy. The most frequently used hashtag (#Organic) confirmed previous assumptions that consumers focus on the value of organic products. Consumers seek the organic attribute in food products (Ríos Guayasamín *et al.,* 2016) and then share this on Instagram. Previous studies also confirmed the ability of farmers to respond to this demand (Yu *et al.,* 2014).

This research also identified four main crowds of Instagram user communities based on shared hashtags. The Product Oriented group was the largest, with hashtags in this crowd associated with food characteristics. This was consistent with previous studies showing that, while customers often stated that support of green values, local communities, and small farmers (Smith and Sharp, 2008) were important to them when visiting farmers' markets, the primary focus was on the functional aspects of the products offered at farmers' markets (Pokorná *et al.,* 2015). The second group, referred to as Emotionally Oriented, tended to express the emotions they associated with visits to farmers' markets. While the focus of the hashtags preferred by this group was different from that in the previous group, the results once again confirmed previous studies showing that emotional and social benefits were of importance to visitors to farmers' markets (Pokorná *et al.,* 2015). The third, Socially Oriented, crowd differed the most from the first, Product Oriented, crowd. Hashtags associated with customers' local support of farmers' markets were typical for this group. Local support of farmers' markets by customers is a frequently studied phenomenon, examined to date mainly in view of customer motives. Customer motives have been identified regarding not only the quality of food products, but also secondary social motives (Smith and Sharp, 2008). As previously stated, visitors to farmers' markets purchase locally grown food to express their support for efforts to strengthen local food systems (Smith and Sharp, 2008). However, previous research identified certain regional differences, in that support for local farmers or local produce was more pronounced in rural areas than in urban or metropolitan areas (Betz and Farmer, 2015, Winter, 2003). Moreover, Pokorná *et al.* (2015) identified that Czech customers tended to focus on the functional aspects and benefits of their purchases at farmers' markets, although they also declared local support to be a major factor in attending farmers' markets. Instagram users expressed their awareness of the need for such support, and the identified tendency of this crowd to express their support for local production and local communities was an important outcome of this study. Finally, the Social-Product Oriented crowd offered a combined focus on the fresh product and local social aspects of farmers' markets, consistent with previous research (Flores and Vilalobos, 2018) showing that that customers perceived local products to be fresher than those produced elsewhere. Individuals in this group expressed their liking for fresh food (hashtags #Fresh and #Food) and also expressed their social support with the hashtag #Farmtotable. Farm-to-table is used to express the link between agriculture and social aspects, where consumers affirm social support for food products marketed as local (Boyce, 2013).

The types of interconnections observed between individual hashtags in the #farmersmarket network indicated that the relationships between the four groups could be defined as a tight crowd (Smith *et al.,* 2014). Although four strong communities were extracted, the interconnections between individual hashtags inside these communities were very similar to the interconnections to hashtags outside the communities, as illustrated by a modularity of 0.221. This finding is of importance for understanding the behavior of social network users in relation to farmers' markets. No polarized groups were identified in this environment, unlike groups identified elsewhere, for example in the political environment (Smith, *et al.,* 2014). For marketing communication usage, if one of the four communities were targeted, this communication content would be interesting not only for the targeted community, but also for the remaining three communities (Figure 2). In other words, product oriented customers create a strong community in the field of farmers' markets (Figure 2) and, owing to the low modularity level, it is possible to communicate all of the desired values concurrently, without arousing negative feedback from one of other strong communities.

The highest eigenvector centrality value was identified with the #Organic hashtag, which was strongly associated with users posting contributions related to farmers' markets, as observed previously (Wolf *et al.,* 2005). The #Fresh and #Food hashtags had the second and third highest eigenvector centralities, at 0.669

and 0.667, respectively. The importance of these hashtags confirms previous research (Besik and Nagurney, 2017; Mack and Tong, 2015; Mejía and García-Díazb, 2017) that connected fresh food with farmers' markets. The fourth highest eigenvector centrality value (0.635) was for the #Local hashtag, consistent with previous research showing that this factor influenced purchasing behavior at farmers' markets (McNeill and Hale, 2016; Yu *et al.,* 2017). The #Vegan hashtag had an eigenvector centrality value of 0.632, reflecting the view that farmers' markets are good platforms for obtaining vegan or vegetarian food (Yarar and Orth, 2018). The remaining hashtag with an eigenvector centrality value >0.6 was #Healthy (0.629). This factor is linked to some of the previous factors: fresh, vegan, and organic food are seen as healthy (Besik and Nagurney, 2017; Heiss *et al.,* 2017). This study demonstrates that Social Network Analysis can encompass a broader area of research that has been analyzed in depth in individual studies and suggests that Social Network Analysis may be a useful first analytical step to identify factors related to given topic that can then be investigated fully using qualitative methods.

5.1 Future research

Worldwide, there were approximately 2.46 billion social network users in 2017 (Statista, 2017a). Where geodata are available, this allows the possibility of examining socio-cultural differences between states, regions, or continents in the field of consumer experience. Using historical data (Instagram was launched in 2010), it is also possible to possible to analyze changes in customer experience over time and to identify new trends in the context of farmers' markets for use marketing communications.

The outcomes of this study can also be used as the basis for conducting a long-term study. The next step in this research would be to identify connections between adjectives and products or posts containing; for example, photographs linked to these hashtags. These findings would help define suitable messages to be communicated. The results of the analysis confirmed that Social Network Analysis can be useful for extending knowledge of farmers' markets and their customers. The current trends in social networking indicate that these techniques would also be applicable to other areas of the food sector such as organic food, local food, healthy food, and others.

6. Conclusions

Farmers' markets are enjoying increased popularity. Market organizers wish to meet the needs of both consumers and vendors by ensuring customer satisfaction while maintaining profitability for vendors. This research has identified some potentially important implications for farmers' market vendors and organizers.

This analysis explored the most common hashtags used on Instagram in relation to farmers' markets: (1) #Organic, (2) #Fresh, (3) #Local, (4) #Vegan, and (5) #Healthy. This information is useful for vendors and organizers of farmers' markets in terms of the segmentation and targeting phases of developing marketing communications, both with respect to creating specific messages and with respect to determining appropriate media for message dissemination. Examples include journal articles and social media fanpages that focus on topics of interest to farmers' market customers such as organic products, vegan diet, or healthy food.

This research can be used in the context of product portfolio management for evaluation of current products, or for creating new products. Diversification of products into multiple categories not only reduces the risk but also increases the number of customers by targeting multiple segments. Current portfolios should be evaluated with respect to the organic, fresh, local, vegan, or healthy value signifiers and options for improvement should be investigated, for example by adding additional products to the portfolio or by enhancing the value of current products by adding new features that will be perceived favorably by customers. For example, retailers with vegetables or dairy products who communicate fresh and healthy values should consider the following: obtaining a Locally Grown product label; adding a product based on organic farming to the portfolio; or meeting the requirements of a vegan diet. These marketing activities and product management strategies may enhance retailer competitiveness.

Four segments were identified by community analysis: product, emotional, social, and product-social orientation. Knowledge of these segments is useful for improving marketing communication development. From the perspective of farmers' markets, customers should be offered products not only on the basis of product orientation (for example, organic or fresh), but also by social (for example, local product) and emotional (for example, love or spring) orientations. The low polarity of each group indicated that hashtags were firmly interconnected within one segment, but also outside the segment. This suggests that marketing communications focusing on several characteristics may be appropriate and effective and not subject to negative backlash from one of the groups. For example, the strongly product oriented group would not be discouraged by marketing that took social aspects into consideration. This contrasts with the highly polarized political field, where it is difficult to communicate successfully to distinct segments at the same time.

Vendors at farmers' markets wishing to attract visitors need to understand customer key values when communicating with the public. A key outcome of this research was the finding that 37.68% of Instagram messages matched social and emotional segments. The low modularity observed (0.221) indicated that customers considered social and emotional characteristics, as well as product characteristics, to be of importance. Customers valued customer relationships based on the social-emotional core as well as pragmatic product purchase and need satisfaction. The communication of these values increases the merit of the product for the customer, and it is therefore important to address emotional and social values such as the point of sale and the overall positioning of the vendor in the market as well as values related to the food product itself. Marketing communications focused solely on product qualities would not successfully address the customer segment that is emotionally orientated.

During development of marketing communications, market organizers and vendors should seek to communicate the identified values but should also proactively address these segments though the development of targeted products. For example, value could be added to organic or vegan products by adding a social context to the message, such as 'come and buy healthy organic products and support local farmers'. Another practical implication that connects identified communities with identified hashtags could be the use of a 'Locally Grown' product label on products as this will target both the social and product perceptions of the customer.

Farmers' markets are enjoying increased popularity. Customers require options for purchasing goods directly from producers due to their need for high-quality food products and their characteristics, as well as satisfying their social and emotional needs. As previously noted, activity and purchasing power at farmers' markets lies with the customer. Vendors who wish to succeed in selling their produce through alternative chains, such as farmers' markets, must be able to respond to customer values and should try to lead communications with the consumers based on this knowledge. Existing vendors should evaluate their strategies based on this knowledge and new vendors should create product portfolios that fit customers' needs.

6.1 Limitations of the study

The major limitation of this study is the focus on Instagram users, who form only part of the community that engages with farmers' markets. Approximately 59% of Internet users between the ages of 18 and 29 and 33% of Internet users between the ages of 30 and 49, use Instagram. Demographic data such as such as sex or age cannot be extracted and analyzed from the Instagram social network because of the privacy policy of the network. A limitation of hashtag-based data collection strategies is that they do not necessarily capture all the communications within and surrounding a primary communicative exchange.

Acknowledgements

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