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Using NLP to investigate consumers' expectations regarding food retail*

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Introduction

The 2019 Responsible Consumption Index set up by GreenFlex and the Agency for the Environment and Energy Management (ADEME) [1] shows that 57% of French people believe that the economic system needs to be revised. It indicates that 60% of French people are concerned by the state of the planet and believe urgent action is needed. Similarly, 86% would prefer to live tomorrow in a society less focused on consumption. Hence, consumption is no longer viewed as the satisfaction of individual needs but also as an act involving social and environmental concerns.

From this perspective, it is appropriate to examine people's representations regarding the general issue of food and "eating better" to identify the elements that impact their acts of consumption. In particular, it is worth understanding people's views of the role of retailers so as to better understand their expectations and choices, insofar as distrust of large companies is at its highest since only 27% of French people trust them, which amounts to a loss of 31 points since 2004.

The major food retailers, whose role is crucial in the economic activity of the various countries in which they operate, have changed appreciably. At first, they were focused solely upon the profitability of their outlets; gradually, however, they have shown greater consumer awareness through the Efficient Consumer Response (ECR) approach. Some of their recent positions go beyond economic merit to respond to societal pressure. For instance, efforts have been made regarding packaging, food waste, respect for the producers, environmental sustainability, etc.

This study proposes a new vision of consumers that draws attention to the numerous nested representations that create individuals instead of viewing them solely in a consumption context. The concepts of corporate social responsibility (CSR) and corporate social performance (CSP) are used to show how the food distribution sector has already adapted to the new expectations. At the same time, in order to analyze consumers' transformation, the theory of socialization is used to apprehend both normative behaviors and the more critical ones, together with the wordings used to express people's new expectations, namely what seems to indicate a break in their views of food.

In the light of these insights, over 5,950 propositions regarding the future of food consumption in France are examined; they are collected from the consultation platform make.org [2] and analyzed via natural language processing (NLP) methods based upon machine learning and deep learning. These propositions indicate the broad views of the French concerning the issue of food, which involve both the responsibilities of the various industry players and the consumers' specific expectations of the distribution operators. The analysis indicates that, far from being seen as just intermediaries between industry players and consumers, retailers are viewed as having a genuine role to play regarding their product range, and they are expected to take positions revealing their commitment to the sector. In contrast, the issue of digital technology is absent from comments. These findings show that digitization is not an end in itself but rather a set of means to facilitate the setting up of consumers' new expectations.

Corporate social responsibility

Definition and challenges of CSR

The literature reveals the complexity of the notion of CSR. Carroll (1979) lists 20-odd definitions in use and outlines the common general orientation seeking to cover the corporate responsibilities that go beyond the economic activity. These definitions also include work on the stakeholders or sustainable development (Freeman, 1984; Parmar *et al.*, 2010). The common thread running through these approaches is to extend the accountability of private businesses to reflect the notion of "public accountability" (Preston and Post, 1975). Recently, Shea and Hawn (2019) have provided a synthesis of the benefits of CSR and insist on the benefits relating to purchase intentions or the reputation and image of companies.

At the same time, a more critical angle is found in work defining CSR as a power relationship showing the capacity of the different role players in a particular system to exert pressure upon or coerce others (Brenann, 2014). CSR is also viewed as an ideology seeking to divert popular attention so as to enhance the image of private enterprise (El-Akremi *et al.*, 2008).

Hence, numerous studies have shown both the significance and the advantage for private enterprise of integrating social and environmental concerns into their various activities (Porter and Kramer, 2006). The notion of shared value reconciles the different postures and brings to light the advantages for a company of committing to a CSR approach if the starting point is a common shared value (Porter and Kramer, 2011).

After this brief overview of the CSR concept, it is necessary to investigate the evolution of the distribution sector.

The evolution of the distribution sector and CSR

The emergence of large food retail in the 1960s is characterized by a period of strong growth and mass purchases and marked by the integral self-service system. The competitive climate encourages the various players in the food distribution sector. At that time, their intervention concerns mainly prices, presented as the only competitive advantage.

Rapidly, the increased number of players, competitive pressure, and the economic downturn compel the players to try to stand out and find a new competitive advantage. At the same time, the retailers increase actions and public communication relating to CSR. Hence, their discourse increasingly includes the issue of CSR (Utgard, 2018).

All three major phases of development of CSR may be used to examine the evolution of the retailers' discourse (Frederick, 1978; Wood, 1991):

- CSR 1 (1950-1960) corresponds to companies' voluntary commitment, sometimes accompanied by a philosophical thrust, to integrate social and environmental dimensions into their operations.
- CSR 2 (197-1980) corresponds more to response actions to societal pressure, and the approach becomes more strategic.
- CSP (1980-2000) combines the first two visions, but it is much more pragmatic and normative since it is oriented toward performance and the measure of it.

In the domain of food distribution, there are few or no CSR 1 actions since, as mentioned earlier, environmental concerns did not originally take societal dimensions into account. In contrast, there were numerous communications in line with CSR 2. These reflect the desire to stand out by taking external societal pressure into account (Ackerman and Bauer, 1976). However, the corporate discourse was still focused upon the consumers' interests in the market sphere. Hence,

there were campaigns related to the development of in-house brands to better serve consumers. There were also campaigns focusing on consumers' well-being in their day-to-day living. However, at that time, only the market sphere was involved. From the beginning of the 2000s, messages go beyond the focus on consumers to include the various industry players, and producers in particular. The performance-oriented discourse becomes more general and incorporates all industry players. There were campaigns illustrating the link with producers or dealing with people's carbon footprint.

CSR is thus a complex concept; it offers overlapping rather than opposing visions in a useful framework to understand consumers' representations. As consumers too are exposed to complex environments, it appears necessary to change our analysis frameworks. Most studies on consumer behaviors appear to be restricted to the market sphere only and to focus upon one segment of consumer behaviors only, whereas consumers are individuals operating in many different spheres.

Development of consumer expectations: The contribution of the theory of socialization

The studies dealing with consumer socialization have usually focused on children and have revealed the set of patterns children learn very early that impact upon their purchasing decisions in adulthood (Churchill and Moschis, 1979; Ward and Wackman, 1974). Ward (1974: p.2) defines consumer socialization as "processes by which young people acquire skills, knowledge, and attitudes relevant to their functioning as consumers in the marketplace. The author adds, however, that the core mechanisms are set in place during childhood and adolescence; adult learning continues, however, and structures may develop and change. Industrialized countries are currently experiencing far-reaching changes related to the climate and the environment, which has induced a genuine awareness of environmental issues that may be expected to influence consumers. As indicated in the introduction, the index set up by GreenFlex and ADEME indicates that 60% of French people are concerned by the state of the planet and believe urgent action is needed.

The traditional models of distribution are showing signs of weakening, which may indicate that the consumer socialization processes have not been taken sufficiently into account, as these currently include numerous societal concerns. This notion is in line with Dubet and Martucelli's (1996) argument that socialization involves tension between normative and cultural internalization and critical distancing.

These issues are required to understand the development of consumer behaviors in the large food retail sector. On the one hand, consumers have internalized the integral self-service model and the principle of mass distribution of consumer goods as children and adolescents. Studies focusing on children have shown their early presence in retail outlets and their role as prescribers, then purchasers, even for product categories that do not really concern them (Brée, 2012). On the other hand, the same consumers operate in increasingly diverse environments and have virtually unlimited access to the information that may prompt a more critical view.

These observations are in line with Simonson and Rosen (2013) who present an alternative view of the effects of marketing upon consumers. The authors propose a new way of conceptualizing consumers' decision making, on the premise that consumers are now much more informed than

previously and can make connections and analyses. Hence, they act more rationally and have different expectations of brands and industry players.

Similarly, the work on "modern man" (Dubet and Martucelli, 1996), much discussed in the 1990s, arises from a more modern society in which people are exposed to an increasing number of players and subject to greater stimulation from the environment. People belong to numerous social circles and are confronted to an increasing number of tasks and roles. Consequently, it is essential for companies to take hold of societal concerns, as revealed by work on CSR and consumer socialization studies. It is clear that consumers' views and expectations regarding distribution players have changed.

Research method

Data

To investigate the development of consumers' views, this study is based upon qualitative data relating to the main theme of "eating better". Its purpose is to analyze people's spontaneous discourse so as to identify the various spheres involved and understand their overall representation in people's minds. The study uses data collected on a citizen consultation platform (make.org) and focuses upon the topic of food in general rather than that of distribution in particular. French people were invited to answer the following question: "How can we enable everybody to eat better?" The consultation thus lists the propositions made by the French people who answered the question freely in one sentence; the sole constraint was the start of the sentence (the form "It is necessary..." was imposed) and its length (140 characters). The format made it possible to identify the different notions entangled in consumers' representations and to explore more fully the specific characteristics of expectations of the food retailers.

Data pre-processing

The purpose of this stage is to facilitate the algorithmic processes by decreasing noisy data and optimizing computation time by reducing the vocabulary size upstream. The fist data preprocessing step involves tokenization, namely cutting up the text into units composed of single words and multi-word items in order to facilitate the next pre-processing step. Punctuation, diacritics, and capitals are deleted. Next, the stop-words are removed. For the study, the list of stop words in the natural language toolkit (NLTK) in Python [3] was used. Finally, stemming reduced the complexity of the corpus vocabulary. This step involved removing the prefix and/or suffix of each word to reduce it to its stem, using the Snowball stemming algorithm developed by Martin Porter and implemented in NLTK in Python [3].

Vector representation of the citizens' vocabulary via the Word2Vec algorithm

The automatic processing of a large volume of text data via machine learning algorithms (such as clustering) requires prior transformation of the text into numerical value. Word embedding methods are thus used to represent words as numerical vectors. Among these methods, the *Word2Vec* algorithm has been developed by Google research teams directed by Mikolov (Mikolov, Chen *et al.*, 2013). This technique uses artificial neural networks; its specificity is to

determine the word vectors in such a way that words that are semantically close have a similar vector representation.

This is unsupervised learning; hence, this method can be used for any raw text, without any prior manual coding; namely, there is no human coding done beforehand. The Word2Vec is based upon a skip-gram neuronal architecture; the purpose of this deep learning algorithm is to provide a vector representation of each word, taking the context surrounding the word (i.e. the words around this word) into account. To this end, a hidden layer neural network perceptron was defined. It is the hidden layer that defines the space of word representations. The neural network inputs the word and predicts an output word context (see Figure 1).

Using the vector representations of words, a vector representation of the citizens' propositions becomes possible. The vector representation of a proposition is thus the average of the word vectors making up this proposition (Milolov, Suttskever et al., 2013).

Results

These word embedding methods were used to meet the two research goals of the study:

- Determining the main themes arising from the citizen propositions to better understand people's perceptions of the role of large retail outlets in the "eating better" paradigm.
- Determining the words that are semantically close to the notion of "large retail outlets" in the citizens' vocabulary.

Automatic detection of themes

To identify the main themes mentioned in the citizens' propositions, a clustering technique was used on the vector representations of these propositions, using a k-means algorithm. Figure 2 shows the word clouds representing the seven main themes that emerged from this classification.

For each word cloud, the descriptive vocabulary and the vocabulary of action (i.e. verbs) were isolated so as to identify both the lexical field and the forms of action considered by the respondents. Table 1 shows the description of the seven themes and their significance in the respondents' discourse.

Examining all seven themes and the nature of the related actions indicates that the issue of food does involve all stakeholders (Freeman, 1984). **Consumers** convey a sense of responsibility when they say they need to eat healthier products (less processing, no additives, organic food, etc.), develop individual farming areas (e.g. vegetable gardens), and cook more often. There are answers such as "It is necessary to eliminate processed and highly processed food products, with too much salt, sugar, etc. and to cook raw foods"; "It is necessary to eat organic and local food, take back control, find the time to cook"; "It is necessary to grow our own vegetables"; "It is necessary to accept to spend more time and money to make responsible food purchases (good shopping channel, fair pricing)"; "It is necessary to cook raw products ourselves instead of buying industrial ready meals". At the same time, respondents show they wish to exert power through their consumption when they write, "It is necessary to penalize or boycott the industry players who show no concern for the environment or consumers' health."

Consumers also believe that the **industry players** have a role to play regarding the quality of the products they sell by opting for local producers, respecting the seasons, and reducing packaging. There are phrases such as "It is necessary that the industry players rethink their packaging. Example, the yogurts still packed in cardboard"; "It is necessary that the industry players indicate clearly the nutritional values, the harmful or borderline components and in bold"; "It is necessary that the industry players should stop getting their raw materials from intensive farming before preparing their products".

The responsibility of **producers and farmers** is also mentioned; they are expected to adopt a sustainable production approach that is animal- and environment-friendly. Respondents make numerous propositions such as *"It is necessary that in agriculture and farming, people stop doing senseless stuff, for the sake of a better world and respect for animals"; "It is necessary that we stop intensive farming and go for animal well-being and human health"; "It is necessary that we eat dairy products (milk, eggs) for which we know that the animals are well treated and roam freely"; "It is necessary to stop pesticides. Nature works better on its own."*

Regarding the **public regulatory sphere**, expectations cover the fields of education (especially of children) and urban planning (creating areas of urban farming on roofs, in the center of towns). There are propositions such as "It *is necessary that food education be prioritized at the level of kindergartens! They need to understand the impacts of the food they consume!"; "It is necessary that people are educated so they understand that their everyday consumption has an impact upon the environment"; "It is necessary to establish vegetable gardens everywhere in the cities, they must be free, and everyone should look after them"; "It is necessary to increase the number of vegetable gardens in town, including hanging on the balconies and roofs of new buildings!"*

Other expectations include a stricter regulatory environment for the various industry players. Hence, there are numerous propositions couched in terms of prohibitions, obligations, or restrictions, such as "It is necessary that all industry players be forced to produce products with less fat, sugar, and salt contents"; "It is necessary that industry players be prohibited from using plastics in various forms"; "It is necessary that the benefits of large retailers are monitored so as to ensure that the small producers are well paid"; "It is necessary to stop the use of pesticides in our country and the importation of products containing GMOs and pesticides"; "It is necessary to prohibit definitively palm oil (whether organic or not) in all our food, and colorants and non-natural preservatives"; "It is necessary to make compulsory the display of all the environmental characteristics of products (pesticide use, CO2 impact)".

Overall, the descriptive vocabulary used for the actions to be taken shows consumers' comprehensive and critical views that correspond to the duality found in the theory of socialization. Numerous propositions worded as prohibitions or obligations show consumers' lack of support for industry players, producers, farmers, and retailers. **Retailers** see their role confined to what they offer consumers. They are expected to promote access to healthy products, in particular by choices centered upon consumer interests rather than their own economic performance. There are propositions such as "*It is necessary to choose local organic producers, within relatively short distances, to negotiate reasonable prices for clients*"; "*It is necessary that they offer us more organic products and the meat of farm-raised animals that live outdoors.*"; "*It is necessary that retailers select and really promote the products of better eating.*"; "*It is necessary that retailers (shops) buy their products from local producers*".

Their action is not found exclusively in any category, but retailers appear to play a decisive role because they are related to very many recommendations concerning different themes. Hence, the lexical field of large retail outlets was examined to understand better consumers' expectations of them.

Focus upon large retail outlets and digital technology

First, the words whose vector representations are close to the vector word "distribution" were identified: *retailer, supermarket, shop*, and *large superstore*. Next, a T-distributed Stochastic Neighbor Embedding (t-SNE) reduction technique (Maaten and Hinton, 2008) helped visualize these results in two dimensions. Figure 3 shows the projection of 3,600 word vectors in this space, to which a focus upon large retail-related vocabulary is added.

Over 6% of all propositions include this vocabulary relating to large retail outlets, and they are found within two themes (see Table 2).

The representation of retailers' responsibility in the future of food is thus shown. Retailers are expected to contribute, through their actions, to promoting both the consumption and the production of healthy, organic, and local products. They should also facilitate access to these products (Table 2). Close examination of these propositions shows that the expectations of retailers concern very different spheres. Generally, expectations crystallize consumers' desire for actions that are not directed solely towards profit making but that include taking into account the societal issues related to consumption and ecology.

Hence, there are **expectations regarding the product range** on offer. Indirectly, consumers expect retailers to show their power through their offering, which is evidenced in propositions such as "It is necessary that stores propose tasty products, not just looking good"; "It is necessary that supermarkets respect the seasonality of products and accept to propose damaged goods and not throw away"; "It is necessary to promote small farms and pesticide-free farming in short distribution channels in all retail outlets, including the large ones".

There are also many propositions that go beyond the traditional role of retailers and indicate **expectations of commitment**, which is congruent with studies consequent to CSR orientations that draw attention to the significance of managing simultaneously the social, environmental, and financial concerns (Elkington, 1997). Examples of such propositions include "*It is necessary that stores such as Carrefour or Leclerc return part of their profits to the farmers or else they should lower their prices*"; "*It is necessary to find more organic shops in cities [offering products] at affordable prices and promoting neighborhood shops*"; "*It is necessary that large retailers put pressure on agribusiness to remove all the harmful additives*."

In an omnichannel and multichannel environment, the digital transformation of the distribution sector is often viewed as a growth track. As with distribution, no theme is directly related to this notion. First, the words of the lexical field related to digital technology were identified: *Internet, digital, drive, online, site, technology, computer*. Next, an exploration of the corpus revealed that only 11 propositions are associated with this topic. This result indicates that in this context, digital technology is simply one way of meeting goals that may involve **information and learning, linking people, or marketing**. All 11 propositions may be grouped under one of these three themes.

Information-related propositions include the following: "It is necessary that people get information from the Internet for their daily menus and then they can cook"; "It is necessary that the nutriscores are indicated on line for the drive-in, and in fact, ideally everywhere. Online, alternatives to the poor scores must be proposed"; "It is necessary that towns and rural areas are reconnected through the creation of a physical and digital space devoted to leaning about taste and good practices"; "It is necessary to set up training programs about food that are freely available on the Internet. Lots of topics need to be discussed".

The theme of linking people is found in propositions such as "It is necessary to set up an Internet platform to promote the sale of local products from farms or neighborhood shops"; "It is necessary that the web sites of stores that sell fool share simple, quick, and cheap recipes" or "It is necessary that we get closer to each other, foster helping behaviors, for example, if someone does not have a fridge, we help him to find one on a donation site."

Finally, the commercial aspect is also brought to light in propositions such as "It is necessary that in the evening, the unsold products are shown on an Internet site that sells hampers for 5 euros instead of throwing away"; "It is necessary that people can order all fresh products on a price-per-kilo on the sites of online shopping"; "It is necessary to buy directly from the market gardeners, and know about them. So, create a web site of all the regions, particularly near the large cities"; and finally, "It is necessary to create reliable sites that propose lists of food products that can suit everybody, and according to the seasons."

The small number of propositions precludes generalization, but they nevertheless indicate that while digital technology may be a useful tool, it does not feature as a priority for consumers.

Conclusion and research avenues

It appears from the analysis that consumers have considerable knowledge about food and that the various spheres they inhabit are intertwined. Consumers are mindful of the needs for better eating, taking into account societal concerns ranging from consideration of the difficulties of producers and farmers to environmental concerns and animal well-being.

Overall, consumers expect retailers to exert their power at the level of the operational leverage they may possess, in particular regarding the range of products they offer. At the same time, they expect full commitment from the retailers, whom they clearly do not see as mere intermediaries but as true contributors at the heart of the societal challenges societies are currently facing. Furthermore, examining the propositions related to prohibitions, limitations, and injunctions reveals that these are mostly directed at the industry players while the notions of commitment and action are associated rather with the retailers. Hence, the latter's image is part of the numerous expectations formulated.

In contrast, digital technology is not a top level concern in the domain of food. Consumers view digital technology solely as a tool, and their expectations are placed elsewhere. It is true that non-food distribution is more concerned with technology-oriented applications, through for example, the concept of customer experience. Food retail, in contrast, is associated with high societal expectations that retailers need to take into account. The respondent profile of the study is not representative of the majority of consumers. Nevertheless, the development of new forms of distribution such as neighborhood shops, new sales outlets such as the French Associations for the Maintenance of Local Farming (AMAP) or local brands bear witness to profound changes in consumers' expectations.

The study results indicate a much less normative and much more critical consumer behavior that is highly likely to intensify. At a time when retailers struggle to generate growth, this study provides an alternative vision of the possible direction retailers could commit their efforts to renew their offering. However, the sheer magnitude of the expectations and the nature of the responsibilities undertaken should alert retailers to the risk of greenwashing. Numerous players are stepping up to speak out on the issue of food, such as the Groupe Carrefour when introducing its Act for Food program, and it is of vital importance to put in place concrete actions. These actions may use digital technology, but that is not an end in itself.

[1] https://presse.ademe.fr/wp-content/uploads/2019/09/Etude2019_CPVF_FR.pdf

[2] <u>https://about.make.org/about-mieuxmanger</u>

[3] <u>https://www.nltk.org/</u>

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