The customers' inquiries to wine webs: relating users' interests to wine ontological description

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ᴱᴺᴳ Abstract: In this paper we seek to analyse the wine domain with the aim at designing the knowledge representation structure that might be used by wine applications ontology-based. To do so, we have considered data from wine ontologies already on the market and have analysed the domain comparing it from a different perspective: the consumer's. In order to do so, we have checked consumers' most-frequent questions in blogs so that we could depict the wine map according to consumers' needs. This analysis shows how many of the questions and interests raised about wine by the internet searcher do not have to do with wine tasting features only, but go far beyond traditional aspects that now relate to health, leisure and other activities. The wine tourist is one of these internet searchers who wonders about wine and about the broad conceptual world wine is part of. A new knowledge representation schema with customer and activities slots as part of the model is suggested as a way to represent the domain and be helpful to answer for the new world of interest wine-web surfers exhibit when they access the web.
Keywords: wine domain, ontological description, customer, wine tourism, web analysis.

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1. Introduction: The Wine Event and A New Perspective from the Customer

Analysing the customer has been the focus of attention of market studies in the last few decades and since one of the most successful current commercial activities is the one that concerns wine, where producer-product-customer are part of the key elements that determine such commercial activity, this new scenario of the wine event defines important aspects in its domain and conforms its knowledge representation structure. Considering wine from such a commercial event perspective, bearing in mind the complexity and instability of the wine domain, we discover that wine tourism has already established as a highly developed market type where many people, business and interests are involved and where most of the queries and search for information made by customers occur on the internet via accessing wineries' web pages or renowned wine blogs, where information regarding winery facilities and wine tasting experience programs are displayed and commented on. This way, taking the wine domain within this commercial perspective, the language of wine tourism has been the focus of research during the last decades as lexicon and style have posed as salient features of this specialised language type. Either considering the language of tourism —of which enotourism is a part- as a specialised language with lexical and morphosyntactic features distinct from ordinary language, or as a broad term with sub-sectors, there are scholars, among which Calvi (2000, 2001) and Mauri (2014) are found, who sustain that the language of tourism, —and hence, that of enotourism— is not a unitary one, but with different subgenres that depend on the communicative mode and the type of recipient. Besides this classification, which we subscribe, there are other criteria that condition language use in our specific research field of wine tourism. Firstly, the sender clearly determines language choices, as it is not the same the

information given by scientists, experts or scholars compared to what influencers may comment. Second, we cannot forget the commercial dimension wine in general and wine tourism in particular has. As language varies according to the type of sender, language depends on the purpose of the activity wine is part of, too: the message tries to convince or persuade the customer for a specific decision. And third, language —lexical choices, phrases, sentences— is determined by the customer: age, culture, education are parameters that condition language use. Having mentioned some of the elements to be considered when analysing the language of wine, as mentioned by Meluzzi and Balsamo (2021), there is a change in the linguistic strategies used derived by the new channels of communication —social media— and by a new focus of attention on the consumer. The information produced by cellars have to adapt and consider customers' needs and enquiries; such information should fulfil consumers' expectations because the customer plays a key role. As stated by these authors 'the first necessary step in the development of an effective communication strategy is getting to know the audience' (2021: 8). Communication takes place through a specialised discourse determined by the information shared by sender and recipient and the purpose of communication. The linguistic strategy is determined by several ways to get closer to the client, as sharing values or having an empathic attitude with her/him are ways of drawing attention and thus of obtaining response. This approach that considers multiple senders and recipients (socio-discursive factor), genre and text types, cognitive, grammatical or terminological factors as elements that determine the specialised discourse has already been explained by Cabré (2009) as part of the Communicative Theory of Terminology (CTT), where terms are simultaneously studied as units of language, of cognition and of social function, as well as by Guantiva et al. (2008) or Ciapuscio (2003). Already Cabré (1997) suggested what she called horizontal and vertical axes to describe specialised language variation. Within this communicative frame the horizontal axe refers to theme and perspective that classifies specialised languages into areas of knowledge, whereas the vertical axe relates to contextual and extra-linguistic conditions affecting text production determined by intention, specialised level, language use and type of participants involved in the act of communication. In this sense, and having in mind Hoffmann (1998)'s discourse vertical variation, our study analyses wine language examples as part of the specialised discourse and the informative discourse classification in an attempt to bring together all kinds of customers.

But as mentioned above, analysing the customer (recipient) with linguistic aims has overlapped with studies having different research purposes. In fact, identifying the customer's needs has already been the object of analysis of market intelligence for the last decades (Dahan and Hauser, 1993; Griffin and Hauser, 2002). The easy and, so, massive access for information on the Internet has revealed a new world of potential buyers in those searching the web. People check the Internet for information or advice in health, travel matters or automotive purchases, as explained by Urban and Hauser (2004) study, where customers' needs searching for an automobile are identified by 'listening in' the dialogues created by customers when using the Internet. A very detailed description of this new era of commerce focused on the customer analysis is given by Walsh and Godfrey (2000), who already stated e-tailers' new strategy concentrating on the identification of the unique wishes of each and every customer, taking advantage of new technology. The customer is no longer classified in categories, but gathering information about her/him from their declared data or from their behavioural data —the customer's navigation through sites— is the key to make up a detailed picture of the customer's unique preferences. As these authors state, personal information, purchasing habits and click-streams are the three types of data collected by e-tailers with one and main target in mind, that is to say, browsers are potential customers.

1.1 The wine tourist

Thus, as it has been pointed out above, several spheres converge on this topic: market studies, commerce analyses, tourism industry and wine. So, since our initial proposal was to convey an analysis from the consumer perspective, in order to contextualise our theme we start by giving some general description of the wine tourist so that we can identify later the different aspects the ontological representation should cover. The starting point seems to be considering wine tourists as a potential market and, thus, thinking of them as consumers. But such a simplistic view could give us a too reduced picture of the whole wine event, where other aspects participate actively in the description of such an interesting and complex matter. As Charters and Ali-Knight (2002: 318) affirm 'Wine tourism is rarely a discrete activity, but will probably be undertaken in conjunction with some or all of rural, eco-, cultural or adventure tourism, and its participants are unlikely to separate the various tourism forms'.

Several classifications have been made regarding wine tourists. Thus, wineries refer to 'casual tourists' or 'sophisticated drinker' depending on the tourist's demands of experience and information; Mitchell, Hall and McIntosh (2000) classified Italian wine tourists in four classes:

— 'the Professional', who knows wines and the wine world; he can judge a wine's virtues and faults; he is interested in new experiences.
— 'The Impassioned Neophyte', who likes wines, enjoys foods, the countryside and generally travels with friends. Ready to learn but not as a professional.
— 'the Hanger-On', wealthy and attracted to wines because that knowledge is a mark of distinction.
— 'the Drinker', who visits wineries as an alternative to a bar and also asks to buy in bulk.

Hall (1996) established three categories 'wine lovers', 'wine interested' and 'curious tourists' and Charters and Ali-Knight (2002) refer to four different types:

— 'Wine lover' with a subtype 'Connoisseur', who reads books about wine, likes wine tourism and wants to buy wine at wineries.
— 'Wine interested', tourist interested in wine, with some knowledge on it.
— 'Wine novice', declared as a curious tourist with limited knowledge on wine.
— 'Hanger-on', tourist who visits wineries as part of the group experience.

On the other hand, Bruwer et al. (2002) mention five types of consumer behaviour: enjoyment oriented social wine drinkers, fashion/image oriented wine drinkers, ritual oriented conspicuous wine enthusiasts, purposeful inconspicuous premium wine drinkers and basic wine drinkers.

These authors, in their effort to describe the wine tourist, have attended to general data, such as origin, age, education or income of the participants, as well as more specific aspects that categorise them, such as wine knowledge or education, culture, values, motivation, lifestyle or attitudes. In fact, these features depict the kind of person that conforms as a wine tourist and much of their choices (buying wine, making questions, enrolling in the wine touristic activity, enrolling in the wine tasting activity, making other touristic activities around, etc.) depend on the type of customer she/he is. The tourist profile, in this specific case, and the 'wine interested' person's enquiries in general are key elements to be considered when formalising any wine domain.

2. Wine Web Visitors: The Role of Frequently Asked Question (FAQ) Web Pages

As it has been stated above, the customer in a broad sense is not only an out of context client, but someone who surfs the web and conforms to online requirements. There are many wine websites that present general information about wine but that do not offer the specific information needed. Chatbots are a very helpful tool aiming at providing detailed information to the questions being posed. One of the possible design procedures is to set an ontology as a basis from where to retrieve information. In the ontology the basic terms and their relationships are defined capturing, this way, the relevant domain knowledge. As stated in Vegesna et al. (2018) on the E-commerce domain, an ontology based chatbot is proposed to get the desired appropriate answer to the user's query, having as one of its advantages that the chatbot has not pre-programmed responses. In this sense, devising an ontology seems to be the first step on which further tools may rely on. Another example is the LRI-Core (Breuker and Winkels 2003), a core ontology aimed at the legal domain that has been used as top-ontology in several projects, such as CLIME (Winkels et al. 1998), on which a question-answering system was based.

In order to do that, the wine ontology will have to cover areas of knowledge that exceed the traditional ones —wine description (eye, nose and taste), wine production processes or storage— and face new wine-related aspects that are part of the wine sphere and that depict wine, not only as a consumable thing, but as part of a social event with a precise role in it. In this context wine marketing and wine tourism emerge as two of the most representative wine spheres under development, subsets both of the e-business superset defined by Turban et al. (2000) and Beynon-Davies et al. (2002). As subsets of e-business, the interactivity with customers is considered as one of the most critical factors for small and medium enterprises (SMEs)' competitiveness (Sparkes and Thomas 2001) and the internet conforms as the most convenient channel to fulfil lots of information demanded by consumers. The coming of Web 2.0 has changed the role of customers without a doubt. They are no longer passive recipients of services but active participants in the creation of models and innovation. We can see how social media has become an integral part of customer service. By liking posts, for example, the customer contact and social interaction takes place, making it possible to interact with businesses. As a matter of fact, online customers' preferences —criticism and dissatisfaction expressed by clients in online reviews— have already been considered by Suau Jiménez (2019) in the domain of e-tourism as a way to improve hotel websites. In our case, the internet as a marketing tool, and wine websites in particular, should cover consumer's needs regarding informational, transactional and relational aspects: the site should present detailed and complete information on the products and should provide for interactivity with consumers. Following Begalli et al. (2009)'s analysis of e-marketing of Italian wines, who make a thorough study of Italian wineries strategies and apply Rayport and Jaworski (2001)'s 7Cs framework as a model for the interface design of a web-based system, we focus on Begalli's customer services aspect (7C model Connection) and choice (7C model Content), which include, among others, Frequently Asked Questions (FAQ) pages for the former, and presence of agro-tourism activities for the latter, as parameters a wine web-based system must have. Our authors in their effort to make a sound analysis of web marketing strategies implemented by Italian wineries, specify in detail the different parameters of evaluation that could influence web sites quality. Facts such as 'products presentation', 'range of products', 'direct sale availability' or 'delivery time' are counted as critical elements in the design of a web-based system. But not only, 'presence of agro-tourism activities' or 'Frequently asked questions (FAQ)' are enumerated in the evaluation set. As it is stated in their work, only 13.9% of existing web sites in Italy include 'agro-tourism activities', whereas none of the ten companies under analysis showed a FAQ link in the browser. Their analysis shows how wineries use web sites as a show case but they do not benefit from the possible interaction with the consumer.

In this sense, we intend to analyse a collection of FAQ pages of a set of wine websites as an input that could help us design the new (if so) wine-landscape of interests the wine event shows. Following the push-pull motivation framework used to study touristic travelling too (Chen and Chen, 2015), according to which tourists are pushed by their motivational strengths and pulled by the destination's attractions, the motivational strength (push) may be estimated from the set of enquiries customers type in the wine browser that later

conforms the FAQ web page. In there, questions, interests, doubts or thoughts, etc. are exposed. Whether applying a push-pull analysis or adopting a psychological approach, the needs and claims of wine customers should be fulfilled by wine websites that should not follow just a show case marketing strategy for wine selling but that should include aspects of a wider and more complex scene. Bruwer et al. (2018) highlights how, even though most of wineries' visitors belong to the Wine Buyers cluster, hedonic motivations linked to pairing wine and food experience, feeling dining at the cellar or learning about wine are significant motives for visiting cellars. In the same line Bressolles and Durrieu (2010) and Bruwer and Wood (2005) affirm buying not to be the primary motivation for visiting a wine web site but comparing prices and getting information. As a response to those expectations winery websites should provide with related information regarding all aspects of the wine scenery so that they could act as pull motivations to attract wine web visitors. In fact, an analysis of visitors' demands related to push motivations may help us design the conceptual field of wine.

As life changes, so do people's interests. In this sense, customers may have wine-related questions never asked before, as it is the case of 'Is this wine vegetarian/vegan? Is your wine vegan friendly? Are your wines gluten free? Is this wine organic? What is the nutritional value of white wines?' Our proposal is that wine ontologies should include these new aspects to give a thorough description of wine where consumers' interests could be satisfied.

Thus, within the aim of analysing the wine domain and the challenge to devise a wine knowledge representation model, in our study we will try to give answer to the following research questions:

1. What is the role of the consumer in the wine ontological description?
2. What do FAQ pages show? Are they just a window to consumers' interests or do they have to do with merchandising strategies?
3. Should the concept of wine be represented according to traditional intrinsic properties or, if the concept of wine is considered as a living experience in a wider sense, should the ontological model include other slots?

3. Ontologies of Specific Domains within the frame of Applied Linguistics

In our study the important role of the customer has already been pointed out when considering her/his needs and interests through the questions made within FAQ web pages in wine websites. The concept of wine gets ever more complex and, thus, its formalisation a challenge. In their efforts to face a classification and explanation of entities, ontology building has already shown to be a very active and dynamic field. Starting from Gruber (1993)'s definition of an ontology as a specification of a conceptualisation and as a description of concepts and relations that exist for an individual or a community of individuals, we share the general assumption that an ontology provides a means to represent knowledge. In general terms knowledge representation tries to solve problems by representing formally and structurally domains and relations within domains. In other words, it is a way to classify things, to manage unstructured information. Within the sphere of Applied Linguistics, ontologies are used to describe the underlying structure of language and its relation to the world. In this sense, the linguistic analysis plays an important part when defining the terms used and designing a formal model. The linguistic analysis helps to detect language patterns, concepts, terms and structures, precise of specific domains and the formal model conforms as the basis for carrying out automated tasks in the domain. Ontologies, along with semantic networks and frame systems, are one way of representing knowledge, but unlike frame systems, these are oriented to supply with information to other applications that need specific knowledge on that particular domain. It is a type of knowledge used by knowledge-based systems. Even if the three models are used in natural language processing to represent knowledge about the world, semantic frames (Fillmore and Baker, 2010) are more specific while ontologies tend to be more abstract.

In our case, the wine ontology is a structured representation of the wine domain. And, yet, what in theory seems to be a very obvious and simple thing to do, it is quite the opposite. As stated by Mommers (2010) regarding ontologies in the legal domain, an inherent problem for ontologies is that the domain is in continuous change, and mainly, the language used to describe it since one of the features of wine language is the creative use of linguistic expressions. Following Mommers (2010)'s reflections on the problems found in building up legal representation frameworks, questions such as the need for a low degree of change in the domain or the combination of wine concepts and real-world concepts representing the domain are part of the difficulties any researcher aiming at devising a knowledge representation schema faces with.

Besides language change, this author underlines how ontologies may vary not only depending on the object of analysis itself, but depending on the philosophical approach underlying the model. According to him, legal ontologies may be classified in three different sets regarding their relation to reality. As he mentions, there are three main approaches underlying the ontological framework design of the legal domain:

− Semantically oriented approaches, that show the relation between language and reality. WordNet is an example of it, where concepts are represented by a set of synsets, and these are linked to each other by a fixed set of relations (Miller, 1995; Fellbaum, 1998). WordNet is a framework of relations among concepts.
− Epistemically oriented approaches, that show the relation between knowledge and reality. Valente's (1995) 'functional ontology' is an example of it. And,
− Ontologically oriented approaches, that make claims about existence. Van Kralingen (1995) 'frame based ontology' is an early ontologically oriented theory, where entities represented by frames with slots filled with characteristics for each occurrence of the entity constitute his organising proposal.

On the other hand, Steve (1998) distinguishes three types:

− Domain ontologies, that represent specialized knowledge of a specific domain or subdomain.
− Generic ontologies, that represent general concepts, and
− Meta-ontologies, that represent conceptualizations underlying knowledge representation formalisms.

And Guarino (1998) includes a fourth one:

− Task-ontologies, created for a specific task or activity.

Having these classifications in mind and considering wine domain in a wider sense than the traditional efforts shown in wine ontologies, our model follows the principles of an ontologically-oriented model, where concepts are represented by classes, properties and relations and where the limits of the wine domain itself are questioned. But, as stated above, our model is supposed to underlie a wine application resource, so it belongs to Guarino's task-oriented ontology type within the domain ontology specific class.

As stated by Mommers on the legal domain, ontologies may have several applications ranging from translation of documents —codifying the meaning of terms may help in manual translation activities—, automated classification and summarizing —where ontologies can help in classification techniques— or information retrieval —still the most widely application of ontologies. Codifying the meaning of concepts and their relations can help for finding information —and question answering— where detailed and deep knowledge representations are required for any automatic system in order to produce an automatic answer. The linguistic formalisation is part of the work involved in the production of the current natural language processing applications mostly requested by companies, that is to say, those ones dealing with sentiment analysis, text classification, machine translation systems or automated answering systems like smart assistants and chatbots (Torrijos-Caruda 2020). In this process, when building an ontology, the first step is learning from text, that is to say, the collection of terms and concepts and establishing relations among them. These terms and concepts and their relations determine the knowledge representation model an ontology is. In Davis et al. (1993: 17)'s own words 'it is a surrogate, a substitute for the thing itself'. As stated by these authors, two of the questions are: How close the surrogate is to the real thing? and, what attributes of the original it makes explicit and which it omits? Besides, formalizing the wine domain may help to represent the knowledge that is hidden among concepts. Having a look at some of the available wine ontologies on the market, we have realised the domain focuses on wine features mainly, but some aspects have not been represented. The customer has been left out.

Since our knowledge representation formalism is supposed to be at the back of the wine resource, the role of the customer plays an important part in the configuration of the wine domain. From this perspective, we have analysed the most frequently asked questions users make and have checked if all questions were conceptually represented in traditional wine ontologies already on the market.

4. Analysing the Sherry Domain and the FAQ Web Pages as Methodological Procedure: Findings and Discussion

As mentioned above, we have analysed a set of Frequently Asked Questions (FAQ) users post to some of the most representative wine blogs regarding their doubts and concerns about wine. For our selection of sources and since our focus of analysis is the customers' interests rather than the expert answers, we did not want to be too exclusive and so have to reduce the type of blogs to the ones offered by expert people only. Thus, besides those blogs found in the *Consejo Regulador de los Vinos de Jerez y Manzanilla* official website[1] as "Sherry guest bloggers", we have selected others too, where customers' questions about Sherry were addressed, and have named it as Corpus A[2]. Besides this, a corpus B[3] (named General corpus and formed by wine blogger websites on wine in general) have been created in order to widen up the field of research and consider inquires posted regarding any type of wine. In both corpora any question has been considered, questioning either on wine production, composition, storage, pairing, shipping, etc. Even if the most salient and repeated questions bloggers receive could have been identified with a quick reading and, thus, it could have been possible to get a general idea of wine-related interests, we have decided to follow a corpus linguistics procedure using AntConc [3.5.8], —a corpus search and concordancing program—, and have compared both corpora analysing word frequency, keywords and collocation patterns: corpus A (Sherry Corpus) with 10460 tokens —the corpus of questions related to Sherry offered in FAQs pages of Sherry blogs— and corpus B (General Corpus) with 8064 tokens —the corpus of FAQs posted to general wine websites—. With this approach we aim at finding a more precise and accurate identification of terms and a better detection of the differences so that these results could guide ontology builders to incorporate aspects not considered by wine experts but that are highly demanded by wine lovers.

Table 1 shows an extract of the absolute frequency of the most used words of our corpus A, the Sherry corpus:

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1   The "Consejo Regulador de los vinos de Jerez y Manzanilla" is an organization that regulates the production and quality of wines produced in the Jerez region of Spain. See the official website at: https://www.sherry.wine/sherry-region/consejo-regulador

2   A list of the Sherry bloggers' web pages used is provided in Appendix 1.

3   A list of the wine bloggers' web pages used is provided in Appendix 2.

Table 1. Most frequent words in the Sherry corpus

Rank	Abs. Freq	Word
1	466	Sherry
3	391	Jerez
4	298	Amontillado
17	214	Flor
20	158	Dry
27	131	Nose
32	119	Sweet
35	112	Aging
48	85	Appearance
55	75	Light
54	74	Fresh
58	71	Amber

As the word tokens indicate, the most repeated words in the corpus are related to the classification of the type of Sherry ('amontillado'), the making process ('flor', 'aging') or their taste description ('dry', 'fresh', 'light').

On the other hand, a similar analysis of our Corpus B- FAQ General corpus-, gives us some predictable results and some interesting ones, too. Table 2 shows the high frequency of wh- words used, something that can be guessed since the part of the blogs analysed belongs to the FAQ section. Having a look at the questions being posted, users want to know about what certain wine specific terms mean, how to make, store, decant wine, when to do it, and where (see the following extracts as samples):

> Do you add flavorings to wine to achieve different aromas (i.e. chocolate, cherry)?
> Do you add sugar to make sweet wines?
> How do you make white wine with red grapes?
> Is wine dryness or sweetness due to grape variety?
> How do you make rose wine?
> What is the alcohol content?
> Should I decant?
> How long can wine be cellared?

Table 2. Most frequent words in FAQ pages from corpus B, the General corpus

Rank	Abs. Freq	Word
4	179	What
9	97	Do
10	94	How
12	71	Can
13	63	Does
17	43	Why
18	42	If
19	40	Should
22	34	When
31	21	Mean
68	14	Where

On the other hand, in Table 3 our analysis shows a set of some other most frequent words that are worth underlying. After tagging both corpora with POS tags using TagAnt [1.2.0] as a tool, we have searched for syntactic categories and have found the high use of adjectives such as 'best', 'good', 'clean', adverbs like 'most', 'more', 'much' or nouns such as 'temperature', 'glass', 'home' in them. These words and their frequency might indicate how wine web searchers are asking for evaluative statements on wine drinking or wine making procedures:

Table 3. Most frequent adjs., advs. and nouns in FAQ pages from the General corpus

Rank	Abs. Freq	Word
26	23	Best
27	23	Good
51	16	Temperature
54	15	Clean
57	15	Most
65	14	Glass
73	13	More
74	13	Much
105	9	Home

In fact, a closer look at these words, after analysing their collocates, shows the users' interests. Table 4 shows the frequency of collocates of que interrogative pronoun 'what' as searched term:

Table 4. Frequency of collocates of 'what' as searched term

Rank	Abs. Freq	Freq(L)	Freq(R)	STAT	Collocate
11	22	5	17	5.55430	Mean
12	21	5	16	3.27959	Do
14	19	4	15	5.21155	Best
17	13	1	12	5.01770	Between
18	11	0	11	4.94662	Difference
20	9	1	8	5.48719	Way
21	11	3	8	3.62469	Should
22	11	3	8	3.55430	If

The following examples are an extract of the questions users typed:

> What does it mean when…?
> What grape variety grow…?
> What temperature…?
> What's the best glass?
> What's the best way to keep…?
> What's the best wine?
> What's the best process…?
> What wine should I serve?
> What's the difference between…?

So far the questions underlined above match the common classic expectations. Typically, wine websites tried to inform web browsers on the wine brands and their tasting description. We could say the focus of attention was placed on wine traditional interests, as FAQs regarded the types of wine, grapes, vineyards, wine making process, storage and purchasing. But as mentioned before, the wine world is in constant change. The enquiries surrounding it include other aspects that might be worth considering when devising a general map of wine description. Besides the already settled wine-lovers' concern on wine and pairing, —as shown on most cellars' websites by the information and recipes displayed trying to guide the consumer's best choice—, a closer look at the FAQs gives an already steady line of interests, —not present in every wine website and much more common in those ones from Australia—, that include health, lifestyle or tourism elements as part of the enquiries made by web visitors. The new set of enquiries fit within a new customer's type who is no longer concerned with wine as a beverage, as an exclusive social class identity or as a national symbol only, but who defines himself/herself as environmentally involved, health defender and landscape searcher. People have new interests so they make other questions: 'Is this wine vegetarian? Are your wines gluten free? or What is the nutritional value of white wines?' We suggest the new wine domain should include these new aspects to give a thorough description of wine where consumers' interests are represented. In the following classification we show the different areas customers' enquiries found in our research may fit in:

- **Wine description or wine production:**

  - What grape variety made this wine?
  - What is a Hybrid wine? What is Merlot wine? What is Malbec? What grape is Pinot blanc? What grape is Pinot Noir?
  - Do you add flavorings to wine to achieve different aromas (i.e. chocolate, cherry)?
  - Do you add sugar to make sweet wines?
  - How do you make white wine with red grapes?
  - Is wine dryness or sweetness due to grape variety?
  - How do you make rose wine?
  - Do Italian varieties mean you buy the plants from Italy?
  - What exactly is wine fermentation?
  - How do sparkling wines get carbonated?
  - What does the term 'solera' refer to in Sherry and winemaking?
  - What is the alcohol content?
  - Who's the producer?
  - Which wines are unsweetened, unfortified and have no herbs or spices added?

- **Wine, Health and lifestyle:**

  - Is this wine vegetarian/vegan?
  - Are your wines vegan friendly?
  - Are your wines gluten free?
  - Is this wine organic?
  - What is the nutritional value of white wines?
  - Why does wine give me headaches?
  - Are sulfites dangerous?

- **Wine serving:**

  - Should I decant it?
  - What's the best temperature?
  - Should white wine be chilled when serving?
  - Why do you smell and swirl wine before you take a sip?

- **Storage:**

  - How long can wine be cellared?
  - How long does white wine last?
  - Should wine bottles be regularly rotated?
  - How long can you keep an unopened wine in a kitchen refrigerator?
  - Do I have to store my wine in a temperature-controlled cellar?
  - What is the correct cellar temperature, and do whites and reds need to be different?
  - How long can you keep an unopened wine in a kitchen refrigerator?
  - Can high humidity damage wine?

- **Wine pairing:**

  - Can you suggest some easy wine pairings that would upgrade our weeknight meals?
  - What wine go with bacon?
  - Why is red wine often paired with red meat?
  - What about wine with cheese?

- **Wine, events and lifestyle:**

  - What wine should I serve at a party/business lunch?
  - For a dinner party, is it better to serve one bottle of lots of wines, or lots of bottles of a few wines?
  - How do you pick what to drink?
  - What I am eating, or if I am not eating, what environment I am drinking in – inside vs. outside?
  - Who I am drinking with – business vs. friends?

- **Wine purchasing/merchandising:**

  - Which vintage should I buy?
  - Which wine should I buy?
  - I have this one old bottle; how much is it worth?
  - Can I buy a membership as a gift?

– **Wine evaluation:**

- How to select a good wine glass?
- What's the best wine?

– **Wine and tourism**

- What wineries should I visit?
- 15 steps to a successful winery visit

These interests that act as a push motivation for the wine web surfer may likely become a pull motivation if included as part of the information cellars display. In this line it is surprising to note the limited number of Sherry winery websites with FAQ pages. After analysing the most representative wineries of Sherry, we may confirm that most of the wineries' websites include the following topics:

– Wine description
– Winery description
– Winery visit
– Winery visit and tasting
– Link to online purchasing

Wine making process is mainly described in most Sherry wineries as it is important the historical description of the cellar itself related to the history of the village or area, reinforced with a wide and varied photographic material. In the same way, many wineries include pairing notes as well as touristic activities, such as vineyard visits, visiting museums, flamenco or equestrian exhibition. It is worth mentioning too very few references to the commitment for the sustainable management of natural resources and protection of the environment, with an overt reference to the commitment to the mitigation of climate change, use of renewable energies and the protection of biodiversity. A look on these new interests is shown in the following analysis of wineries[4] within the Marco de Jerez (Sherry wine region):

– Bodegas Altanza (galería del Jerez): it shows winery and wines information, a section for the museum and a link for visiting and tasting.
– Bodegas Álvaro Domecq: it includes information on wine tourism and pairing.
– Bodegas Arfe: it offers information on the winery, pairing and awards. It also includes a blog section.
– Bodegas Argüeso: it offers information on the history, the wineries and it includes a link to touristic routes in the city.
– Bodegas Barbadillo: it includes tasting courses, winery tour guide and wine tasting and pairing experiences. It openly declares its commitment to quality, innovation, ethical and environmentally friendly management. Surprisingly, it classifies 'organics' as one of its types of wines.
– Bodegas Barrero: it offers information on the products, the winery and history. It has a link to visiting the winery and a blog with curiosities.
– Bodegas Caballero: it includes information on wines and environment or CO2 emissions. It also includes information on food safety and wine tourism.
– Bodega La Callejuela: it offers information defined as the essence of wine: the soil and grapevine.
– Bodegas La Cigarrera: it shows information on the winery, history, wines and a link to events that include tasting and pairing activities and current training courses in the area.
– Bodega Conde Peraleda (Grupo Salto al Cielo): it includes sections regarding agriculture, cattle, agritourism and agri-feed.
– Bodega Delgado Zuleta: it includes visiting activities with vineyard tour, tasting and pairing experiences and a touristic visit to the village plus an equestrian show.
– Bodega Díez Mérito: it includes vineyard visits and participation in a flamenco or equestrian exhibition.
– Bodegas Dios Baco: it includes a vineyard visit, besides the winery, as part of the wine touristic activities.
– Bodega grupo Estévez: besides information related to the museum visits, it includes food safety information and environment certification.
– Bodegas Faustino González: it shows a description of the vineyard and a link to visiting and tasting events.
– Bodegas Fundador: it includes references to wine tourism and tasting.
– Bodegas Garvey: it displays pairing recipes.
– Bodega González Byass: it includes information on wine tourism besides information on lifestyle with the magazine 'Vida, Vid, Vino'. It includes information on innovation technologies, sustainability and environment and it includes a wide section that explains the values that define them.
– Bodegas Gutiérrez Colosía: it includes winery visits and social network links.
– Bodegas Herederos Nicolás Martín: it includes visiting the vineyard, drinking and eating experiences and flamenco shows.
– Bodegas Hidalgo La Gitana: it includes vineyard morning and sunset tours and guided winery tour with tasting and eating experiences.

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4   See Appendix 3 for wineries' website links

- Bodega Los Infantes Orleans Borbón: it includes training courses besides tasting and pairing events.
- Bodegas Luis Pérez: it includes detailed information relating soil profiles to wine flavour. It shows a wide description of vineyards and tour and tasting events.
- Bodegas Lustau: it includes tour and tasting events. Besides, it offers a podcast series dedicated to sherry to inform and teach about topics related to sherry and a CSWC degree (Certified Sherry Wine Specialist degree).
- Bodegas El Maestro Sierra: it displays a link entitled 'the culture of Jerez' where Sherry is related to culture, history, literature and identity.
- Bodegas Osborne: it includes sustainability, biodiversity and environment information, besides wine tourism and social networks.
- Bodegas Tradición: it includes a guided tour with tasting and visit to a Spanish painting collection.
- Bodega William and Humbert: it displays a link on innovation with a commitment on sustainable and ecological viticulture. It shows the ecological vineyard.

Table 5 shows a classification of the topics found:

Table 5. Topics found in wineries from the Sherry wine area

Tasting	A detailed description of wines.
Cellar	Description of cellars and their history.
Merchandising	Link to online buying cellars' products.
Pairing	Tips on how to pair wines and food.
Lifestyle and social dimension	Information about sustainable winemaking production within an ecological context.
Leisure	Visits to museums and exhibitions. Visits to cellars and vineyards with wine tasting activities.

5. A Proposal: Enlarging Frame Slots and Values for the Wine Domain

Following the concept of ontology as a structured knowledge representation and subscribing Noy and McGuinness (2001) statement according to which an ontology is useful for analysing domains and making knowledge assumptions explicit, we propose to enlarge the number of classes and properties on the Sherry wine domain with the new aspects winery webpages exhibit. So far, most wine ontologies concentrated on attributes related to colour, body, taste, sugar content —intrinsic properties— or winery, year, name —extrinsic properties. In fact, the object properties involved in traditional wine ontologies included examples such as: 'has_Drink', 'has_Food', 'has_Maker', 'has_Vintageyear', 'has_Winedescriptor' (with 'has_Body', 'has_Colour', 'has_Flavour', 'has_Sugar' as sub properties) or 'madeFromGrape', among others. But there is no mention to the consumer or to the activities related to the wine event when considered from a much wider look. Even if these are not properties, they play a central role implicated in the push-pull motivations wine-centred. The wine domain should widen up as to include the information that many potential customers may search for, so that wine websites match the new type of wine consumer's expectations. Many of the questions made and the search done by web surfers while surfing the net are related to the history of the producers, the historical building, the location of the winery (if next to the vineyard, to an important touristic area, other historical sites, etc.), the grape variety produced in the vineyard and the activities cellars offer —they want to buy wine, to taste, to learn about, to visit the cellar and vineyard—:

Figure 1. Schema of the class 'winery'
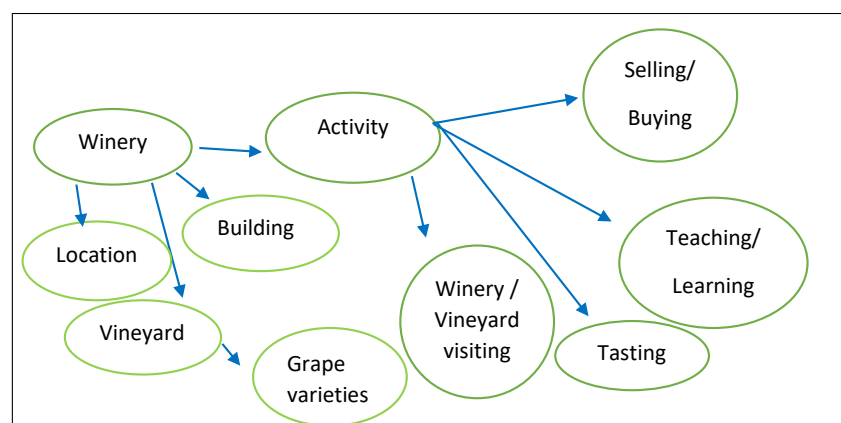
The Object properties 'has_building', 'has_vineyard', 'is_located' relate the class 'winery' to attributes such as 'historical building', 'cathedral-like buildings', 'sand floors', 'dim light', 'high ceilings', 'white limestone soils', 'Marco de Jerez', or 'Moscatel grape type'.

But the internet user is not only interested in taste, price, grape or location of a winery, but in leisure activities that could be found while visiting the cellar. Figure 1 above shows how to relate these activities to the class winery. Similarly, Figure 2 shows how the consumer should be part of the domain too, linked to the classes of 'wine' and 'activity':

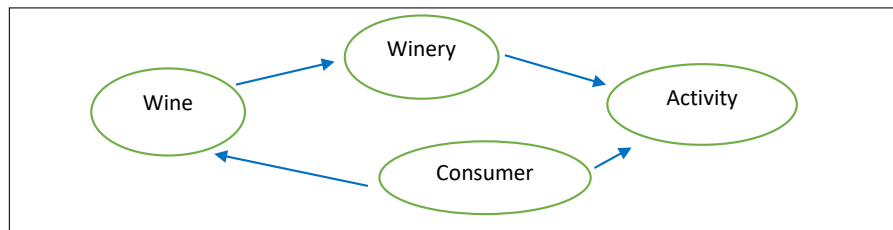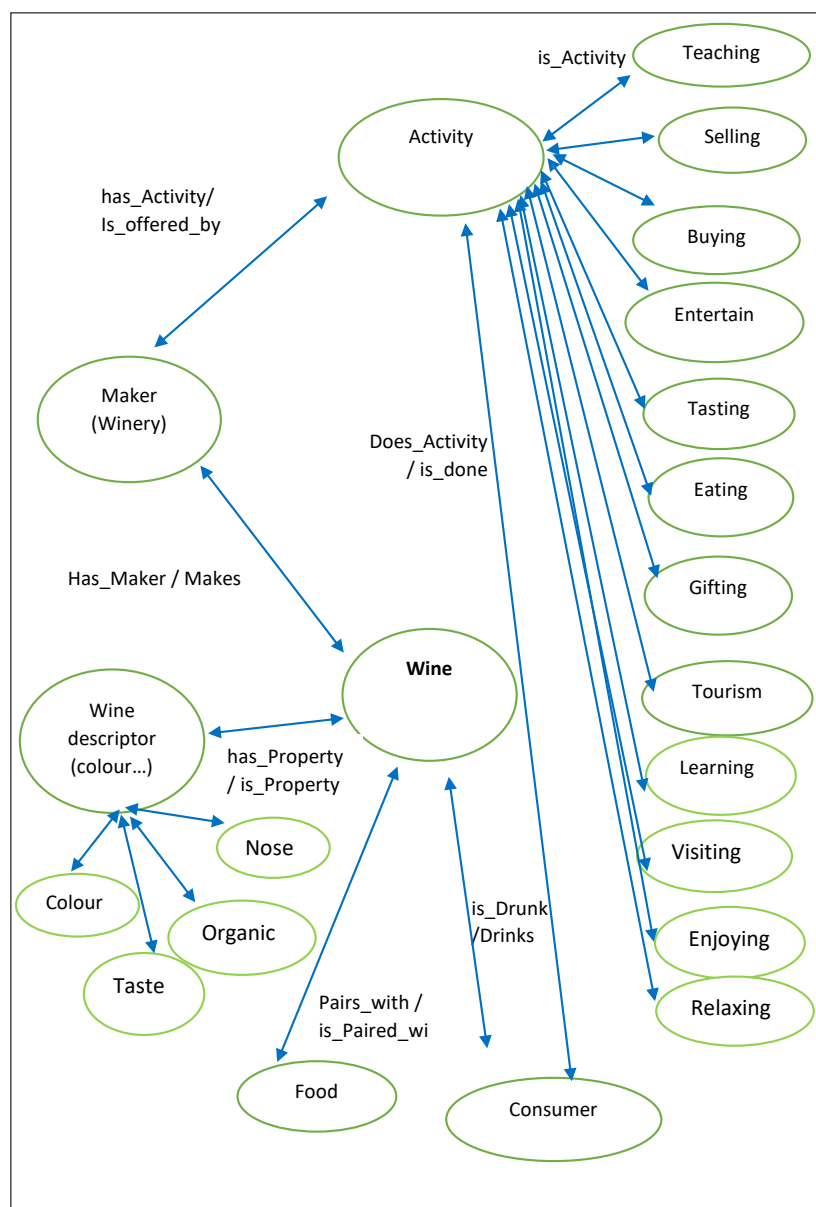Figure 2. Schema of the class 'consumer' linked to the classes 'wine' and 'activity'

Figure 3 shows in more detail and with specification of the object properties an extract of the new suggested classes within the domain:

Figure 3. Schema that shows the class 'wine' linked to the mentioned classes with the object properties specified.

The schema shows how the class 'maker' not only relates to 'wine' through the object property makes/ has a maker, but to the classes 'selling', 'buying', 'entertaining', 'tourism', etc. through the class 'activity' that is linked to the class 'maker' through the object property has_Activity/is_offered_by. The new class suggested, 'consumer', links to the general knowledge frame by two object properties, does_activity/is_done and drinks/ is_drunk, that relates 'consumer' to the classes 'activity' and 'wine' respectively. Figure 3 shows how 'selling', 'gifting', 'doing tourism' are activities that belong to the wine domain as these classes represent the possible offer a winery makes and a wine consumer demands.

On the other hand, the 'consumer' class should be specified with attributes that could depict a great variety of users as simple 'clients', 'wine lovers' or 'wine experts' to the more specific ones such as 'wine-culture concerned', 'tourist', 'environment concerned' or 'health concerned', among others. A sample of it is shown in Figure 4 below:

Figure. 4 Schema of the class 'consumer'
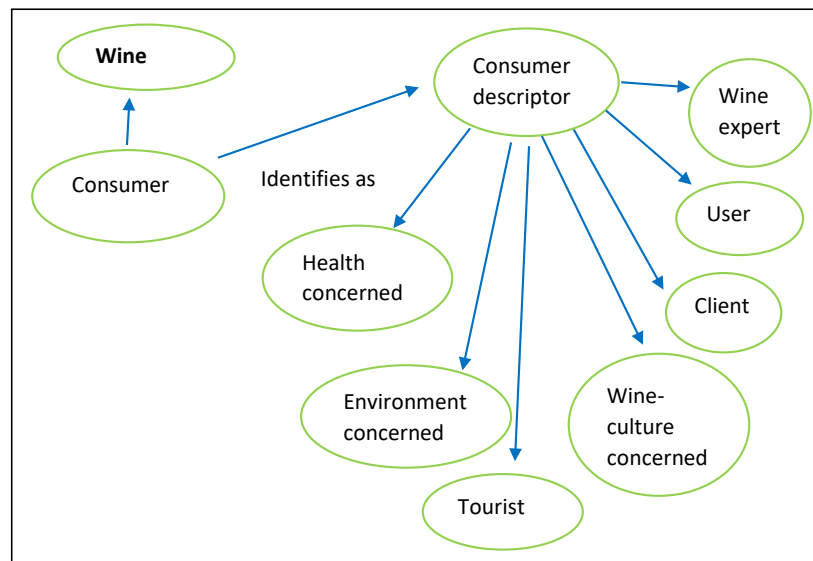
We indicate below, apart from traditional properties related to taste, colour, nose, aging, etc., the new set of object properties that should be part of the wine knowledge representation:

− Owl:topObjectProperty
   • has_Activity
   • has_Maker
   • has_PairingWith
   • has_WineProperty
      – has_WineAcidity
      – has_WineAftertaste
      – has_WineAppearance
      – has_WineNose
      – has_Colour
      – has_WineFinish
      – has_WinePalate
      – has_WinePersistance
      – has_WineSweetness
      – has_WineThroughTheMouth
      – hasWineAgeing
   • has_does_Activity
   • has_Identifies_as
      – is_HealthConcerned
      – is_EnvironmentConcerned
      – is_Tourist
      – is_WineCultureConcerned
      – is_Client
      – is_User
      – is_WineExpert
   • has_Drinking
   • is_Activity
      – is_Teaching

- – is_Buying
- – is_Entertaining
- – is_Tasting
- – is_Eating
- – is_Gifting
- – is_Selling
- – is_doing_Tourism
- – is_Learning
- – is_Visiting
- – is_Relaxing
- – is_Enjoying
- is_Offered_At
- is_made_at
- is_property_of
- is_paired_with
- is_consumed_by
- is_Served
- is_done_by
- is_located_In
- is_made_from_Grape
- is_made_into_Wine
- makes_Wine

As Figure 5 shows below, there are many different areas related to wine other than the traditional ones and wine descriptions should involve most of these concepts since, as it has been found, people surfing the net are much more concerned with wine-related aspects that go far beyond traditional wine descriptor features (taste, aroma, colour, cellar, age). Our proposal suggests to incorporate at least two of them —consumer and activities— in order to achieve and display a deeper picture of the word meaning and answer for the new world of interests this complex word hides:

Figure 5. Schema for the new subdomains of any wine knowledge representation
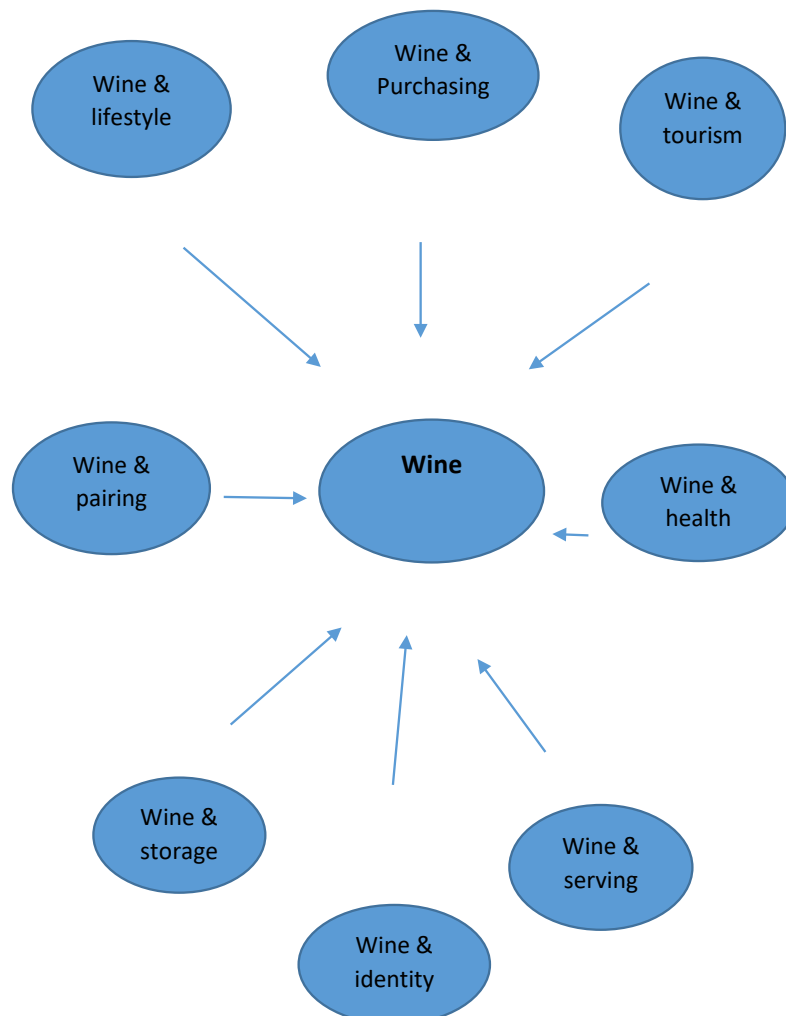
In the following schema —Figure 6— we give an attempt of a prototypical wine website that includes the main subdomains traditionally wine-related and those ones new, which only a few websites already include, but that, as previously mentioned, identify better with the new type of customer that consults the information the selected wine website offers.

Figure 6. Prototypical wine website schema

```
┌─────────────────────────────────────┐
│ Wine website Name: short description │
└─────────────────────────────────────┘
        │
        │   ┌──────────┐
        ├───│  Header  │
        │   └──────────┘
        │        │   ┌──────────────────────────────────────────┐
        │        ├───│ Wine: types, description, production,     │
        │        │   │ storage, decant, organic viticulture,     │
        │        │   │ evaluation                                │
        │        │   └──────────────────────────────────────────┘
        │        │   ┌──────────────────────────────────────────┐
        │        ├───│ Winery: place, history, grapes variety,   │
        │        │   │ soil, region, designation of origin,      │
        │        │   │ quality and sustainability                │
        │        │   └──────────────────────────────────────────┘
        │        │   ┌──────────────────────────────────────────┐
        │        ├───│ Wine pairing and wine in social events:   │
        │        │   │ information and recipes, wine serving      │
        │        │   │ suggestions                               │
        │        │   └──────────────────────────────────────────┘
        │        │   ┌──────────────────────────────────────────┐
        │        ├───│ Wine tourism: tour guide and tasting,     │
        │        │   │ agritourism, enocultural and traditional  │
        │        │   │ cultural experiences                      │
        │        │   └──────────────────────────────────────────┘
        │        │   ┌──────────────────────────────────────────┐
        │        ├───│ Wine learning: e-learning tasting courses,│
        │        │   │ wine courses, e-learning degrees, videos  │
        │        │   └──────────────────────────────────────────┘
        │        │   ┌──────────────────────────────────────────┐
        │        ├───│ Awards                                    │
        │        │   └──────────────────────────────────────────┘
        │        │   ┌──────────────────────────────────────────┐
        │        ├───│ Blog: News and articles related to the    │
        │        │   │ winery, wine awards                        │
        │        │   └──────────────────────────────────────────┘
        │        │   ┌──────────────────────────────────────────┐
        │        └───│ FAQ: the customer contacts the company,   │
        │            │ the company answers and suggests          │
        │            └──────────────────────────────────────────┘
        │   ┌──────────┐
        └───│  Footer  │
            └──────────┘
                 │   ┌──────────────────────────────────────────┐
                 ├───│ The Company identity: family based and    │
                 │   │ tradition combined with innovation and    │
                 │   │ eco-viticulture                           │
                 │   └──────────────────────────────────────────┘
                 │   ┌──────────────────────────────────────────┐
                 ├───│ The consumer: a customer's declared       │
                 │   │ profile template with identity features   │
                 │   │ and interests                             │
                 │   └──────────────────────────────────────────┘
                 │   ┌──────────────────────────────────────────┐
                 ├───│ Quality, innovation: declaration of       │
                 │   │ commitment to environmentally friendly    │
                 │   │ management                                │
                 │   └──────────────────────────────────────────┘
                 │   ┌──────────────────────────────────────────┐
                 ├───│ Shop: products, merchandising             │
                 │   └──────────────────────────────────────────┘
                 │   ┌──────────────────────────────────────────┐
                 ├───│ Contact: How to contact the company       │
                 │   └──────────────────────────────────────────┘
                 │   ┌──────────────────────────────────────────┐
                 └───│ Social network links                      │
                     └──────────────────────────────────────────┘
```

6. Conclusions and Further Research

After having studied wine features through wine knowledge representation structures already on the market and having analysed the questions posed by web users and the information present at wine web pages by magazine experts, bloggers and wineries, with a special emphasis on Sherry and wineries that belong to the Sherry wine region, we group our conclusions in two sets. Firstly, we will mention those ones related to the results found on the internet concerning the description of wine, and secondly, those ones that have to do with the formalization and configuration of knowledge.

On the first hand, we confirm that most of the questions made by web users deal with wine traditional concepts, that is to say, with wine descriptors related to taste, colour, or pairing, price, production and storage. Back to Bruwer et al. (2018), there are primary motivations like taste or buy wine; pairing wines with specific foods or questions related to concepts or terminology, like 'what are the legs' or 'what does tannins mean'. But on the other hand, many questions subscribe Bruwer et al.'s secondary motivations: socializing, being entertained, travelling, relaxation. Thus, consumers make questions related to healthy drinking habits, to wine production in safe and environmentally friendly conditions and to wine consuming linked to social and recreational activities and to cultural identity. In fact, wineries are increasingly including touristic visits in their web pages besides tasting events, wine courses, wine certificates, vineyard visits and touristic experiences in the area. Coming back to the first of our research questions —what is the role of the consumer in the ontological description?—, we suggest that, by interacting with companies and expressing their needs, consumers act as building blocks in the configuration of the wine ontological formalisation.

Going back to the second of our research questions, the FAQ pages analysed in this work, mainly those ones of wineries of the Sherry wine area and others from abroad, seem to be a good element of analysis since they show not only the new consumers' interests through the questions submitted but the new merchandising strategies used by wineries in order to gain new consumers who do not fit with traditional wine drinkers. FAQ pages are a pull tool too. As one of the findings we count the contrast observed among wineries from wine producers in Europe, with not so much information in the FAQ pages and many wineries even with no FAQ page at all, and those ones from Australia that dedicate a lot of space to younger users' inquiries. These wineries pay more attention to sustainability, environment, health and leisure and their web pages —among which FAQ pages are included— display wide information sites to compete with traditional wineries and, so, open to a new promising market. In line with Nowak and Newton (2008) on Millennial consumers, other aspects such as fun and enjoyment of wine, wine country experience and healthy habits should be part of the description of wine and thus part of the wine web sites of wineries in order to attract them as customers and transform them into wine lovers. As Atkins and Nowak (2007) states in their analysis of women as wine consumers and the factors they rely on in making their buying decisions, consumers may be influenced by aspects that are not part of the core product, such as labels, shelf tags, winery region or medals and awards. If making just good products is not enough, the marketing orientation based on getting closer to the consumer should include factors that fulfil their already settled new interests. The wine drinking event has never been more but a wine living experience.

And secondly, related to our third research question and as part of the conclusions that could arise from this work, we have suggested the need to incorporate such facts as part of the wine domain. Activities and consumer are part of the wine knowledge representation being categorized as extrinsic properties that nevertheless model the wine domain together with colour, taste, nose or acidity —intrinsic properties—. The object property 'has_Activity' links the class 'winery' to the multiple events the winery offers. In addition, the class 'consumer' links to the class 'wine' through the object property 'has_drinking' and links to the class 'activity' through the object property 'does_activity'. Besides and most significantly, the class 'consumer' may be linked to other classes that could formalise aspects related to identity. With the object property 'has_Identifies_as'' the class 'consumer' is linked to the whole set of the consumer descriptor attributes, representing now aspects related to the consumer's identity: 'health concerned', 'tourist', 'wine lover' or just 'client', among others. This idea of identity that has been barely suggested in this paper and how to represent it in the model seem to be one of the most interesting aspects for further research since wine and identity are two related concepts mostly reflected by winery websites and a pull motivation for capturing followers.

The work we have followed delves deeper into formalisation schemata mainly, but during the analysing process of consumers' interests, besides the matters mentioned above, new lines of research that complement the one presented here have opened up, that is to say, the analysis of texts sent by customers either having a look at the pragmatic strategies used when interacting with the company, in line with Hyland (2005)'s interactional metadiscourse analysis and Martin and White (2005) approaches, or focusing on the qualitative analysis of consumers's opinions regarding wine websites displays. These topics will be addressed in further research.

Funding

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Appendix 1: Sherry bloggers' webpages

http://criadera.com
http://funkymonkeywine.com
http://howtodrink.co.uk
http://jerez-xeres-sherry.blogspot.com.es
http://paladarytomar.com
http://ranchodephilo.com
http://richardpantry.com
http://sherrysips.com
http://thevineinspiration.org
http://winefolly.com
http://www.alexander-jules.com
http://www.nomspedia.com
http://www.sherrynotes.com
http://www.spanishwinelover.com/HOME
http://www.susyatkins.co.uk
http://www.tanners-wines.co.uk/blog
http://www.vinistas.com
http://www.wineanorak.com/wineblog
http://www.winespectator.com

Appendix 2: Wine bloggers' webpages

http://cambridgewineexcellence.com
http://davidsoninn.com
http://eiffelmarkets.com
http://enjoyhopewellvalleywines.com
http://fourthwavewine.com.au
http://goodclean-wine
http://guides.wsj.com
http://masterandshaken.com
http://rushcutterwinestorage.com.au
http://uvaswineclub.com
http://vinepair.com
http://vinsent.wine
http://wineladybird.com
http://winespectator.com
http://winexpert.com

http://wine.dummies.com
http://www.wines.com

Appendix 3: Wineries' website links

Bodegas Altanza (galería del Jerez): https://galeriadeljerez.com/
Bodegas Álvaro Domecq: www.alvarodomecq.com
Bodegas Arfe: https://bodegasarfe.com/
Bodegas Argüeso: https://bodegasargueso.com/
Bodegas Barbadillo: https://www.barbadillo.com/
Bodegas Barrero: https://bodegasbarrero.com/
Bodegas Caballero: https://caballero.es/
Bodega (La) Callejuela: http://callejuela.es/
Bodega (La) Cigarrera: http://www.bodegaslacigarrera.com/
Bodega Conde Peraleja: www.gruposaltoalcielo.com
Bodega Delgado Zuleta: https://delgadozuleta.com/
Bodega Díez Mérito: www.diezmerito.com
Bodegas Dios Baco: www.bodegasdiosbaco.com
Bodegas grupo Estévez– Bodegas Real Tesoro & Valdespino: www.grupoestevez.es/
Bodegas Faustino González: https://bodegasfaustinogonzalez.com/
Bodegas Fundador: bodegasfundador.site/
Bodegas Garvey: www.grupogarvey.com
Bodegas González Byass: www.gonzalezbyass.com/
Bodegas Gutiérrez Colosía: http://www.gutierrezcolosia.com/
Bodegas Herederos Nicolás Martín: http://www.bodegashmartin.com/
Bodegas Hidalgo La Gitana: https://bodegashidalgolagitana.com/
Bodega (Los) Infantes Orleans Borbón: https://bodegaorleansborbon.es/
Bodegas Luis Pérez: https://bodegasluisperez.com/
Bodegas Lustau: www.lustau.es
Bodegas (El) Maestro Sierra: http://www.maestrosierra.com/home/
Bodegas Osborne "De Mora": https://www.osborne.es/
Bodegas Tradición: https://bodegastradicion.es/en/home-ingles/
Bodegas William & Humbert: www.williams-humbert.com