Speech
Etymology
Idioms
Glossary
NLP
Lemma
Corpora
Meaning
Dictionary
Word
Lexicon
Definition
Pronunciation
Headword
amples
Entry
Lexicology
Dictionary Use
Lexical Resources

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Lexicography for inclusion
493
POSTERS • Reports on Lexicographical and Lexicological Projects

Issues in linking a thesaurus of Macedonian and Thracian gastronomy with the Langual system

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Abstract

As part of our project entitled "GRE-Taste: The Taste of Greece," we have been developing a trilingual (Greek, English and Russian) thesaurus of food served in restaurants in Eastern Macedonia and Thrace. To this end, we have designed a web thesaurus development environment, and have defined facets and subfacets corresponding to the following major categories: Foods (both as ingredients and as dishes); drinks; food sources (and parts thereof); places of origin; preparation methods; functions; state; and, nutrition. For each concept, the preferred (most common) and non-preferred (synonym and hidden) terms are entered; nutritional, cultural and other information appear in separate fields, as do the relationships between concepts (e.g. between a dish and its ingredients, cooking methods or place of origin). In this paper, we examine how the Langual thesaurus can be used to code foods, and as well as the issues involved in the process, such as those related to confusing descriptions and the absence of corresponding Greek dishes. We offer a suggestion for the enrichment of the Langual thesaurus aimed at producing an outcome that might ensure harmonization and interoperability among different applications. We also put forth a proposal that might help resolve Greek terminology challenges encountered in the description and classification process of foods and also regarding issues that arise related to other gastronomic concepts.

Keywords: multilingual thesauri; culinary terminology; culinary lexicography; Langual thesaurus; food classification; food description

1 Introduction

As part of our project entitled "GRE-Taste: The Taste of Greece," we have been developing a trilingual thesaurus of food served in restaurants in Eastern Macedonia and Thrace. We have designed and implemented a lexicographic web environment that accommodates a set of texts retrieved from restaurant menus in the study area. This has enabled the development of a thesaurus containing information on food-related dishes and concepts, which is complemented by dietary and cultural information concerning the dishes and their ingredients. The objective of this project is to support local travellers in their quest for gastronomical and cultural experiences by developing a multilingual tool for the search, retrieval and presentation of information on food according to the following specific criteria: Name; ingredients; source; preparation method; state; place of origin; function in the meal; health issues, and others.

In this paper, we will present the efforts to harmonize our work with the Langual thesaurus, an international tool for food description, with linked data in mind. We have recorded the lexicographic issues we have encountered to date in practice, and offer some suggestions regarding the naming, description and classification of dishes.

2 Background

A lot of food-related information is furnished by the media, focusing on various ingredients and preparation guidelines, as well as concerning quality, health, nutrition and other relevant aspects. On the one hand, all of this information may not only be overwhelming, but it may also prove confusing to consumers who must be informed on issues concerning their desires and needs, and also on the effects produced by what they are offered. The terminology used must be appropriate, familiar and properly understood in order to facilitate the culinary experience and also to allow consumers to make healthy choices with ease (Himmelsbach et al. 2014). Additionally, there is a lot of ongoing research internationally on food-related matters, such as food knowledge bases and food semantics, food description and classification, and food search and discovery, most of which aim at extracting food-related information from different data sources by way of specific criteria (Durazzo et al. 2019; Gateau et al. 2019; Haussmann et al. 2019; Zulaika et al. 2018). Drawing upon this research, corresponding systems are being developed that take into account the different needs and aspects of food naming, processing, uses and also other elements, such as local culture, health and nutritional issues.

Food classification and description systems cover specific user needs. Therefore, for the same food product – e.g. a pork product – the classification may differ depending upon whether the item appears in a nutrient database, a consumption database or a contaminant database. These systems have been implemented by regional or international organizations such as the FAO,[1] EuroFIR,[2] the European Union,[3] the Codex Alimentarius Commission[4] and others (Ireland et al. 2002; Ireland & Møller 2000; Ireland & Møller n.d.; FAO 2015). Examples of such systems include: The Langual and Agrovoc Thesaurus; EuroFIR; Eurocode/EFG and INFOODS, among others (Ireland & Møller 2016). Food systems at the national

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[1] http://www.fao.org/infoods/infoods/en/
[2] https://www.eurofir.org/
[3] http://www.efsa.europa.eu/
[4] http://www.fao.org/fao-who-codexalimentarius/en/

level are also being developed, and aim to cover local needs by taking into account specific cultural, economic, social and other conditions. Another interesting advance in food description is the development of food ontologies, such as FoodOn.[5] In addition to the relationships found in a thesaurus, this "field-to-fork" food ontology includes additional terms, such as "has quality," "has part," "is immersed in," "output of" and so on (Dooley et al. 2018).

2.1 The Langual system

Langua is a multifaceted thesaurus system containing terms for the description of foods from different vantage points (i.e. food groups, cooking methods, preservation methods, consumer group and geographical origin). The use of a multifaceted structure permits the description of a food product from several perspectives and allows a search for foods based on a variety of criteria, such as the ability to look for baby food containing cereals or to seek potato-based dishes that have been fried. In order to group foods, Langual uses a number of classification systems, each of which serves a different purpose or a different application area. Each system uses its own description and classification system, which means that information about food is not modelled in the same way or contains the same degree of detail. A unique code (i.e. a Langual code) is assigned to each concept regardless of the classification system, and this can be used to identify a particular food or any other concept described in Langual. Therefore, the Langual thesaurus can be used by specific food databases from different countries, ensuring harmonization and interoperability among different applications.

Controlled terms are used for the representation of concepts describing specific foods, as well as other related issues (processes, methods, states, etc.). Concepts are structured hierarchically into the following facets, which correspond to the different angles mentioned above:

A. Product type
B. Food source
C. Part of plant or animal
E. Physical state, shape or form
F. Extent of heat treatment
G. Cooking method
H. Treatment applied
J. Preservation method
K. Packing medium
M. Container or wrapping
N. Food contact surface
P. Consumer group / dietary use / label claim
R. Geographic places and regions
Z. Adjunct characteristics of food

Each facet is used independently. More than one term from each facet can be used, depending on specific needs and uses. Facet A is the basic facet for the description of food products by type. In the case of multi-ingredient foods, Langual suggests indexing major ingredients by weight, without taking water into consideration; however, specific mixture terms can also be used if one constituent is the first ingredient and the other from the second to fourth ingredient (Ireland & Møller 2013).

The structure of the thesaurus follows the rules for the construction and display of thesauri in ISO international standards (ISO 25964-1; ISO 25964-2). Langual is published in a basic English version (Møller & Ireland 2018a) and in a multilingual version in English, Czech, Danish, French, German, Italian, Portuguese and Spanish (Møller & Ireland 2018b). Compared to the aims of our thesaurus, those of Langual are somewhat different, in that the latter represents food mainly from the perspective of its production and distribution on the market; in contrast, our thesaurus aims at representing the conceptual domain that emerges from the included menus, whose main aim is to facilitate and attract customers to an establishment that offers and/or serves prepared food.

3 Project description

The lexicographic web application that we have designed and implemented provides the interface for the presentation of the content of the restaurant menus we have collected and for the development and display of the thesaurus. The menus were digitized using OCR technology and the resulting data were entered into a database comprising the set of texts to be used as a source for the thesaurus entries. The content of this menu-derived text collection is entered into specifically-structured fields, such as those of dish name, category, description and place of origin.

The thesaurus is organized into facets and subfacets that correspond to major categories that have been identified through the analysis of the names of dishes on the menus (Markantonatou et al. in preparation); examples of these are the main ingredient of a dish, the way the dish is prepared and the way a piece of meat is obtained from the animal (the "cut"). Several of these categories also exist in Langual: Foods (two subfacets for foods – one as ingredients and the other as dishes), drinks, food sources (and parts thereof), places of origin, preparation methods, functions (courses in the meal), state of food, cuts of meat and nutrition.

When recording an entry, the term is entered in the three main languages of the project – Greek, English and Russian – as well as in Latin, if there is a scientific name (for animals and plants). The most common term is noted as the preferred one in each language.[6] Alternative and dialectic or idiomatic variants are recorded as synonymous or hidden terms. Any

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[5] FoodOn: https://foodon.org/. More information on food ontologies is given by Haussmann et al. (2019).
[6] This is because, at present, there is no standard food terminology in Greek specifically dealing with restaurant menus.

Lexicography for inclusion
495
POSTERS • Reports on Lexicographical and Lexicological Projects

relationship between one concept and any other of the same or of a different category is also recorded, such as one between a dish and its ingredients, cooking methods or place of origin. Detailed nutritional information is coded in specific facets, while cultural information and any other useful elements (e.g. recipes) are entered as free text in dedicated note fields. The thesaurus contains more than 1,550 concepts denoted by more than 3,500 terms; concepts interrelate with 35 relation types, producing more than 3,250 relation instances. Thus, this may be viewed as a highly complex project that attempts to harmonize very different issues related to lexicography, terminography and other areas, given the following: Firstly, there is a variety of names and ways of preparation of dishes; secondly, no index is available of controlled food terms in Greek; and, thirdly, no similar research focusing on dishes from restaurant menus has been conducted in Greece to date.

The unique feature of our thesaurus is that all dishes and most ingredients are drawn from the menus of approximately 120 restaurants in Macedonia and Thrace. Consequently, the thesaurus represents the actual language used on the market. In order to list foods by category, to define relationships between concepts, and to link and harmonize our thesaurus with international resources, we also draw on data from official sources, such as the National Code for Foodstuffs and Beverages, European regulations and Langual.
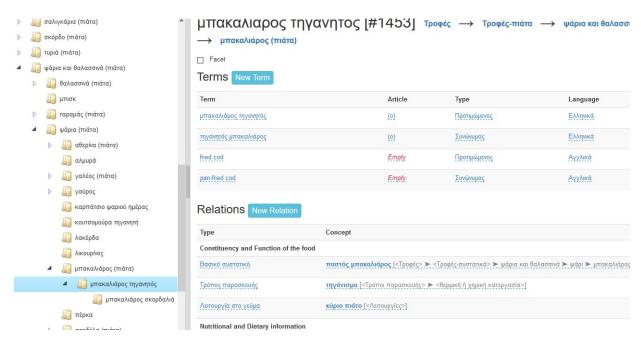

Figure 1: The web environment for the GRE-TASTE thesaurus.

Figure 1 shows the entry for "fried cod." On the left part of the screen, a tree-like representation of the hierarchical structure of the thesaurus is provided, which allows the lexicographer to put the concept in the appropriate place in the hierarchy with a graphic interface. On the right part of the screen, information related to the concept is offered and can be edited. The interface for handling the terms denoting the concept is located in the "Terms" area, while the interface for editing the relations between concepts is found in the "Relations" section.

3.1 Semantic and terminological issues

Taking into consideration the fact that, on the one hand, the names of foods on menus do not usually adhere to any particular rules and that the same dish may have different names in different restaurants and, on the other hand, that we wish to keep the names used on the menus in our system, we had to make decisions on the naming of food products, especially dishes, as well as on syntax and the selection of preferred and non-preferred terms.

The grouping of foods in the thesaurus is based on the main ingredient, the definition of which frequently does not depend on quantity alone, but also on the essential property of the product connected with particular local and cultural data. Such groups are meat dishes, fish and seafood dishes, vegetable dishes and pasta dishes, among others, while the facility for multi-hierarchical relationships in the platform allows us to classify foods into more than one hierarchy. So, for instance, specific legume-based dishes, such as "arakás" (peas), are classified under legumes as well as under "laderá"; the latter is a special and prominent type of Greek dish, one basically cooked in olive oil. Thus, we decided to create a separate category for "laderá" (although olive oil cannot be considered to be the main ingredient).

There are problems in Greek culinary terminology and lexicography when it comes to the description of food. A common issue is that there are several names for the same dish or for very similar dishes. For example, restaurants serve "Greek salad" or "horiátiki," both with the same ingredients; consequently, these have to be listed as synonyms in the thesaurus, with "horiátiki" as the preferred term, based on frequency. Another similar example is lettuce salad. In Greek, it may be "maroulosaláta," "maroúli" or "saláta maroúli," but it may also have a particular name in a specific restaurant, e.g. "to maroúli tis Elénis" (Helen's lettuce). These dishes have the same main ingredient but may differ in other respects. Thus, lettuce salad may or may not include onion, rocket, etc., while specially named dishes have a unique description, e.g. the salad "to maroúli tis Elénis" also contains yoghurt sauce and prosciutto. In our thesaurus, we decided to also list

alternative and optional ingredients, so as to cover different types of dishes, presenting them as specific concepts in addition to the more "generic" entry.[7]

3.2   Working with Langual, comparisons and issues thereof

As already mentioned, the various food coding systems have different levels of detail, depending on the kind of applied system, intended use, needs and so forth. As a result, the coding is different, for example, if the system focuses on nutrient intake (mostly covering processed foods and foods as consumed) or on hazard occurrence in food (interest in raw commodities) (Ireland & Møller 2016). Our system contains entries of dishes served in restaurants and, additionally, of ingredients used to prepare those dishes. To implement the Langual encoding, we had to decide which coding used in it was the most appropriate in our case, of course in combination with the general decisions we have taken concerning the project objectives, the intended users, the structure of our thesaurus, the depth of indexing, etc. Taking into account such parameters, we decided to use EFSA coding as a more complete system and as the one with the greatest detail in description and classification analysis, and also the EuroFIR, but mainly for reasons of formality (it is a requirement for member countries, but is usually too generic), and any other system if the aforementioned two did not cover a particular food product.

We chose to work mainly on facet A – that is, food products – as this is the most important one of all for the description of the foods covered in our project. At the same time, however, facet A presents difficulties as regards the identification and selection of the appropriate coding and the harmonization with our data, not only due to language issues but also to cultural, geographical, environmental and other particularities. The other facets are also used for coding, but concept correspondence is more straightforward, in their case.

Consequently, our concerns are the following: Firstly, to describe and classify foods using the Langual system; and, secondly, to decide on the names of foods, especially those of dishes. Here are some examples illustrating the kind of challenges we have faced with Langual thus far:

- Both our thesaurus and Langual are based on the description of the main ingredient (facet A), which, as noted in 3.1, may depend not only on quantity (as in Langual) but also on cultural and historical data connected with particular dishes. The use of polyhierarchical relationships such as those found in Langual is the solution for cases where more than one place is necessary for coding food (either a dish or any other food product).
- A basic problem is that Langual does not contain a number of culture-specific foods from Greece. This is something that we had expected, but we think that such dishes should be included, not only because they are of local interest but even more so because of the need for understanding, communication and compatibility between local cuisines and cultures.
- In Greek cuisine, we find several dishes sharing the same overall concept but with a varying main ingredient. Such is the case of the different croquettes and "keftédes." The menus studied propose a large variety of dishes in which the main ingredient can be tomatoes, fava (split peas), eggplants, pumpkins, meat, fish, potato, cheese or another ingredient. Some of these – such as "meatballs" ("keftédes"), "fish balls" ("psarokrokétes") and "potato croquettes" ("patatokrokétes") – are found in Langual, but "cheese croquettes" ("tyrokrokétes") and others are not. Furthermore, the use of a generic concept – such as "vegetable-based dishes" – does not cover the requirement that these dishes be coded as members of a particular food family. Thus, in the "Methods of Preparation" facet, apart from the subfacet for "Cooking Methods," we have introduced another one for "Shape, Texture and Form." Consequently, "keftés" is a term in this subfacet; "avgolémono" (egg and lemon sauce), "kebáp" and "gemistá" (stuffed vegetables) are other examples.
- The same issue can be observed in the case of legume-based dishes; in other words, not all types of legume are to be found in Langual. In the case of pea-based dishes, for example, we only find "mushy peas," which is a rather uncommon type of dish in Greece ("arakás").
- "Stifádo" is another typically Greek dish not included in Langual. It is a cooking method which goes as far back as to Byzantine times. On menus, "stifádo" may describe specific dishes such as "rabbit stew"[8] ("kounéli stifádo"), "veal stew" ("moschári stifádo») or "cuttlefish stew" ("soupiés stifádo"). For this reason, we have assigned a particular code for "stifádo" as a cooking method in our thesaurus, while retaining the term "stifádo" as part of the name of particular dishes, and classifying them within the group of the basic ingredient (rabbit dishes, veal dishes, cuttlefish dishes, and the like).
- The ingredients of some composite dishes may also be offered as distinct dishes. Examples of these are "codfish with garlic dip" ("bakaliáros skordaliá"), "pasta with minced meat" ("makarónia me kimá") and "sautéed potatoes with bacon and mushrooms" ("patátes soté me béikon kai manitária"). The general rule for dish classification is applied here as well – namely, according to the main ingredient – while dishes can also be assigned additional codes corresponding to further classifications, if necessary. An example of the latter is "makarónia me kimá," which is coded as a pasta dish but is also assigned a code in meat dishes. As for what applies in Langual, composite dishes are indeed coded in it, though this does not cover all special dish types. In such cases, we can classify the dish under the closest category, or we may decide that a new code is necessary if the dish has a connection to a specific cultural or local background. Thus, "patátes soté me béikon kai manitária" (sautéed potatoes with bacon and mushrooms) is assigned the Langual code for "potatoes, meat and vegetable meal," followed by the description: "The group

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[7] More detailed information is given in Markantonatou et al. (2019). Synecdoche issues are also presented there. For instance, in order to distinguish references to plants from references to dishes, we add the word "dish" in parentheses in the dishes subfacet, i.e. "maroúli" (lettuce) for the plant and "maroúli (dishes)" for dishes based on "maroúli."

[8] We follow the general trend seen on Greek menus and translate "stifado" as "stew," but we also note that this translation only partially describes this special way of cooking, which uses shallots whose shape – most importantly – must be preserved. This demand dictates the overall cooking procedure employed.

includes any type of composite dish based on potatoes, meat, and vegetables. More detailed information on the characterising ingredients can be added with additional facet descriptors." One such facet descriptor is the manner of cooking (sautéed). But in the case of "bakaliáros skordaliá" (codfish with garlic dip), which is both a ceremonial and popular Greek dish, a new code is assigned.

- Another issue is making decisions with regard to items offered on menus for which there is no corresponding entry in Langual. For example, we often find the description "handmade" ("handmade tzatziki," "handmade marinated sardines," and so forth). We have opted to ignore these descriptions in our thesaurus because these features do not distinguish the dish (in other words, they do not characterize it). It is open to discussion, however, whether this is a feature of interest for restaurant customers that our thesaurus may have to take into account in future.[9]

- Problems also arise from differences between the names of foods and their varieties, ranging from the description of specific concepts (that could be enriched through additional content not appearing at present in the international version of the thesaurus) to differences in the classification of concepts on the menus and in Langual. For example, Langual includes "Greek salad" as a specific dish under salads, describing it in the same way as "horiátiki," but it does not mention that "horiátiki" is an alternative name for "Greek salad" (although it is a rather well-known term for it). In addition, Langual does not include "tomato salad" ("ntomatosaláta") or "tomato and cucumber salad" (angourontomáta), two types of salad often served in Greek restaurants and included in our source menus. Green salad may also vary as lettuce salad in the example above.

- In some cases, similar situations may be coded within different facets, which may result in inconsistencies or may create difficulties in selecting the right classification concept. For example, fat content in food is found in facet P (for label claim), in facet Z (for fat content in Eurocode2), and in facet H (for fat removed), while for specific products with fat content in facet A we find mixture terms for milk, milk powder, mayonnaise, salad dressing and cheese.

- It is not always clear what is defined by the terms used, often because of the different classification systems that are included on the same platform that do not bear any relation to each other. This is why Langual managers often emphasize that the term alone is not enough to select a concept and that the description text is more useful. For example, searching for salted seafood such as fish, prawns and other seafood preserved by salting, in facet A we find only one specific product represented by the mixture term "salted cod" (with the scientific name "bacalao"), and the general category "salted seafood" in the same system (EFSA FOODEX2) with the description "The group includes Seafood (any non-mammal, non-fish marine animal) product essentially preserved by salting" (in other words, fish is not included in this category). A solution is offered, of course, in facet J with the descriptor "preserved by salting." As far as cod is concerned, in facet A we also find "cod, dried" (scientifically named "gadus"), including, as noted in the description, "any type of dried cod" (that is, salted or unsalted). This could potentially cause confusion as to where the Greek food "pastós bakaliáros" (salted and dried cod) should be classified.

- Similar confusion is created in Langual in the case of salads with various basic ingredients (such as potatoes, pasta, rice and others). Thus, in EFSA, "pasta salad" is classified under salads as a special salad dish, while in EuroFIR "macaroni salad" and all other salads are coded as "prepared salads" together with "potato salad," "rice salad," "tuna salad" and others. In our thesaurus, each salad is classified according to its basic ingredient (e.g. pasta, potato, rice, tuna and so forth), while all these dishes are also connected through the concept of "salad" in the "Functions" facet.

- Another general issue is the lack of recipes for dishes in Langual, which sometimes may arise as a consequence of an inadequate listing of basic ingredients.

- Not all content found in Langual facets is mirrored exactly in our thesaurus. For instance, the ingredients needed to prepare a dish are included in our subfacet "Ingredients," while in Langual they are found in facet H (TREATMENT APPLIED, category ADDED).

4 Conclusions and further work

Langual is a useful tool for food coding systems, and the uniform Langual code for foods that it provides makes it equally useful for harmonization and interoperability between food databases. The problems, however, presented above show that it cannot be used as is for applications such as the one described here. The GRE-Taste Food Thesaurus is based on data collected from restaurant menus, and is intended to be used mainly by customers in restaurants and similar establishments. The food served varies widely in terms of the content of dishes; the terminology used is also very diverse, as it represents several language-specific, local, idiomatic characteristics, often not easily understood by users. Consequently, merely adjusting our data to Langual is not enough; working with Langual coding, we have to add new information, which in some cases will be able to supplement the description of existing concepts, though sometimes new concepts will need to be added for dishes that do not exist as separate entries within it.

In the future, we aim to continue enriching our thesaurus through the implementation of our classification scheme and the structure of the ontology we have designed. This task involves research on diverse issues such as the semantic and syntactic structure of the names of the dishes, dish-naming strategies and the formal problems concerning ontology, due to the rather disorderly nature of the content of restaurant menus; however, these issues lie beyond the scope of this discussion.

Food "constitutes a rich and complex cultural system […] embracing history and geography," together with language, social studies, race and ethnic identity and other disciplines, as noted by Faber & Vidal Claramonte (2017: 156). Langual and the other food systems show less interest in specific local and cultural parameters. Our project aims to play a vital role in this direction as well, by improving and supplementing existing systems with this local wealth of information on food connected with specific historical, cultural and social data. In this way, it is hoped that our project will also contribute to the tourism economy, to communication between different peoples and cultures, and to sustainable health and nutrition.

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[9] Facet Z in Langual provides the code Z0109 for HOME PREPARED food.

5   References

Dooley, D.M., Griffiths, E.J., Gosal, G.S., Buttigieg, P.L., Hoehndorf, R., Lange, M.C., Schriml, L.M., Brinkman, F.S.L., & Hsiao, W.W.L. (2018). FoodOn: A harmonized food ontology to increase global food traceability, quality control and data integration. In *Npj Science of Food*, 2(1), 23. Accessed at: https://doi.org/10.1038/s41538-018-0032-6 [22-04-2020]

Durazzo, A., Camilli, E., D'Addezio, L., Sette, S., Marconi, S., Piccinelli, R., Le Donne, C., Turrini, A., & Marletta, L. (2019). Italian composite dishes: Description and classification by LanguaL™ and FoodEx2. In *European Food Research and Technology,* 246(2), pp. 287-295.

EFSA. (2015). *The food classification and description system FoodEx 2 (revision 2).* EFSA Supporting Publications, 12(5) Accessed at: https://doi.org/10.2903/sp.efsa.2015.EN-804 [23-04-2020].

Faber, P., & Vidal Claramonte, M.C.Á. (2017). Food terminology as a system of cultural communication. In *Terminology*, 23(1), pp. 155-179.

FAO (Food and Agriculture Organization of the United Nations). (2015). *Guidelines on the collection of information on food processing through food consumption surveys*. Accessed at: http://www.fao.org/3/a-i4690e.pdf [22-04-2020].

Gateau, B., Stahl, C., & Pedretti, O. (2019). Creating a semantic food knowledge base with cooking recipes for a meal recommender system. In *Semantics 2019*, Karlsruhe, 10 September 2019. Accessed at: https://2019.semantics.cc/sites/2019.semantics.cc/files/Stahl-SEMANTICS2019-publishing.pdf [25-04-2020]

GCSL (General Chemical State Laboratory of Greece). (2018). *National Code for Foodstuffs and Beverages.* Accessed at: http://www.gcsl.gr/index.asp?a_id=365&txt=y&show_sub=1 [23-4-2020].

Haussmann, S., Seneviratne, O., Chen, Y., Ne'eman, Y., Codella, J., Chen, C.H., McGuinness, D.L., & Zaki, M.J. (2019). FoodKG: A semantics-driven knowledge graph for food recommendation. In C. Ghidini, O. Hartig, M. Maleshkova, V. Svátek, I. Cruz, A. Hogan, J. Song, M. Lefrançois, & F. Gandon (eds.), *The Semantic Web – ISWC 2019*. Cham: Springer, pp. 146-162.

Himmelsbach, E., Allen, A., & Francas, M. (2014). *Study on the impact of food information on consumers' decision making: final report.* TNS European Behaviour Studies Consortium. Accessed at: https://ec.europa.eu/food/sites/food/files/safety/docs/labelling_legislation_study_food-info-vs-cons-decision_2014.pdf. [23-04-2020].

Ireland, J.D., van Erp-Baart, A., Charrondière, U.R., Møller, A., Smithers, G., & Trichopoulou, A. (2002). Selection of a food classification system and a food composition database for future food consumption surveys. In *European Journal of Clinical Nutrition,* 56(2), S33–S45. Accessed at: https://doi.org/10.1038/sj.ejcn.1601427 [23-04-2020].

Ireland, J.D. & Møller, A. (n.d.) *Guidelines for food classification and description in food databases*. Accessed at: http://www.langual.org/download/Posters/Ireland%20and%20M%C3%B8ller%20%20-%20%20Food%20classification%20and%20description.pdf [23-04-2020].

Ireland, J.D., & Møller, A. (2016). Food classification and description. In B. Caballero, P. M. Finglas, & F. Toldrá (eds.) *Encyclopedia of Food and Health*. Waltham, MA: Academic Press, pp. 1-6.

Ireland, J.D., & Møller, A. (2013). Describing a food using LanguaL™ facets A-Z. In *Food Comp 2013, Wageningen, The Netherlands, 13-25 October 2013*. Accessed at: http://www.langual.org/download/Presentation/LanguaL_facets_A-Z_2013-10-17.pdf [23-04-2020].

Ireland, J.D., & Møller, A. (2000). Review of international food classification and description. In *Journal of Food Composition and Analysis,* 13(4), pp. 529-538. Accessed at: https://doi.org/10.1006/jfca.2000.0921 [23-04-2020].

ISO 25964-1:2011   Information and documentation – Thesauri and interoperability with other vocabularies – Part 1: Thesauri for information retrieval.

ISO 25964-2:2013   Information and documentation – Thesauri and interoperability with other vocabularies – Part 2: Interoperability with other vocabularies.

Markantonatou S., Vacalopoulou, A., Minos, P., Toraki, K. & Pavlides, G. (2019). Thesaurus of gastronomy in Macedonia and in Thrace. In: *12th ELETO Conference «Hellenic Language and Terminology» Proceedings, Athens, Greece, 7-9 November 2019*. Accessed at: http://www.eleto.gr/en/papers.htm#12thPapers [28/04/2020].

Møller A., Ireland J. (2018a). *LanguaL™ 2017 – The LanguaL™ Thesaurus*. Technical Report. Danish Food Informatics. Accessed at: DOI: 10.13140/RG.2.2.23131.26404/ [23-04-2020].

Møller, A., & Ireland, J. (2018b). *LanguaL™ 2017—Multilingual Thesaurus (English – Czech – Danish – French – German – Italian – Portuguese – Spanish)*. Technical Report. Danish Food Informatics. Accessed at: DOI: 10.13140/RG.2.2.13274.64964 [23-4-2020].

Zulaika, U., Gutiérrez, A., & López-de-Ipiña, D. (2018). Enhancing profile and context aware relevant food search through knowledge graphs. In *12th International Conference on Ubiquitous Computing and Ambient Intelligence (UCAmI 2018) Proceedings,* Punta Cana, Dominican Republic, 4-7 December 2018. Accessed at: https://doi.org/10.3390/proceedings2191228 [28/04/2020].