In search of the "right" word

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Abstract

We report on a user needs investigation carried out in the framework of the project EKFRASIS[1] that developed a platform for supporting authoring work in Modern Greek. The platform had as a backbone a conceptually organised dictionary enhanced with rich lexicographic and morphosyntactic information. Organisation of information and encoding drew on Semantic Web technologies (ontologies). Users were all professional authors (of literature, editors, translators, journalists) working for well-established firms. They were all familiar with printed conceptually organized dictionaries while most of them used a computer. They were asked to specify how the platform would be helpful to them when they searched for a word for which they had only vague or few clues, a situation that was familiar to all of them. Users preferred to have, in a first step, easy access to limited but to-the-point lexical information while access to rich semantic information should be provided at a second step. They were interested in rich lexical material although they were not really able to identify the relations that would help them retrieve it. They strongly preferred an organization of material by concept and PoS and appreciated easy access to normative information.

1 Introduction

We present an investigation of user needs that was conducted in the process of developing a platform for supporting authoring work in Modern Greek. One main component of this platform is the dictionary "EKFRASIS" (literally '*expression*'). EKFRASIS exploits technology and ideas developed for the Semantic Web (Guarino and Welty, 2002) to encode a conceptually organized dictionary enriched with translations as well as a wealth of lexicographic and morphosyntactic information. The overall organisation of the dictionary and, partially of the platform, aims at helping the user who needs a word but has few clues or just guesses about it and about its way of use.

The interviewed users were all professionals: journalists, translators, editors and authors of literature.

In this survey, we aimed to map user expectations concerning interaction with the dictionary rather than to look for appropriate ways for populating it. Of course, some of the conclusions reached here may be useful for collecting linguistic material as well.

2 The "recollection problem"

Authors (of any type of text) often find themselves in the uncomfortable position whereby they remember or feel that the "right" word exists but they can not recall it. Here, we will call this situation the "recollection problem". Alphabetically organised dictionaries are of little help

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in such situations. Of course, the recollection problem is a well known one (for a discussion, see Zock and Bilac, 2004; Zock and Schwab, 2008). Works with an international reputation have tried to face it and, of course, Roget's Thesaurus, a printed dictionary, and WordNet and EuroWordNet, both digital ones, spring easily to mind. An interesting difference between the two dictionaries is exactly about the interaction with the user: while in Roget's lexical relations are left implicit and material is explicit, in WordNet one has to go via lexical relations such as "hyponymy" and "sister term" to find the material. In short, in Roget's one is given the material directly and no previous familiarity with taxonomies is required while in WordNet one has to guess what taxonomic labels can offer in each case.

Furthermore, just finding a word is often not enough to guarantee confidence in its usage, so information provided by an assortment of relevant sources is indispensable. Of course, printed dictionaries would expand to unmanageable volume if they accommodated all necessary information, but digital dictionaries are not subject to such limitations. For instance, Roget's does not provide syntactic information but WordNet does. Digital lexica that have been compiled for NLP purposes such as Acquilex (Briscoe et al., 1993) and Simple have tried to accommodate semantic, syntactic, morphological and pragmatic information structured in a principled way and make it available to machines. In the Semantic Web era, efforts to better axiomatise the established resources have been made (Gangemi et al., 200; Old, 2004) as well as to combine detailed linguistic with ontological information for the purposes of Machine Translation (Nirenburg and Raskin, 2004). Such efforts were oriented to NLP mainly.

As regards human users, Roget's success suggests that while wealth of material and good organisation of it matters, it is not necessary to present explicitly the relations among words in a 'concept'[2] in order to provide a good solution to the recollection problem. On the other hand, humans do instinctively look for words on the basis of domain relations several of which can be argued to mirror (aspects of) human cognition (Gaume et al., 2003; Kremer et al., 2008). Furthermore, the data we will present here indicate that searching for a word is also a matter of habit and training, having a lot to do with one's profession and familiarity with certain types of dictionary.

As already said, we report on a user requirement survey that was conducted in the framework of the project EKFRASIS. Our aim was primarily to see how the lexicographic material should be presented to the user; however, we were also interested in fine-tuning our ideas about the nature of the material required. We start with a brief presentation of the main ideas behind the dictionary EKFRASIS. Next, we talk about how we organized the survey. For each group of questions addressed to the users, we present and comment their responses. Finally, we present our conclusions and decisions as regards the architecture of the dictionary EKFRASIS.

3 About EKFRASIS

A few words about the dictionary EKFRASIS are in order to set the context of the survey discussed in this paper.

EKFRASIS is a digital lexicon of Modern Greek (MG). [3] MG market makes available mainly alphabetically ordered printed dictionaries and, more recently, dictionaries of synonyms and antonyms. There is no dictionary of MG that combines lexicographic with semantic and morphosyntactic information.

There is one excellent thesaurus of Modern Greek, the "Onomasticon" by Theofilos Vostantzoglou, published back in 1962. "Onomasticon" enjoys great reputation among Greek intellectuals. T. Vostantzoglou drew a lot on Roget's Thesaurus. His material is organized in concepts and each concept is further structured into smaller groups of words. Notably, he introduced certain innovations of his own: contrastive presentation of concepts, eg "Joking" and "Speaking seriously" are presented contrastively on the same page using a special format, short definition of groups of words that form a concept and information on style. In addition, spe-

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[2] We use the term *concept* to define a set of words that are conceptually related. Such sets are defined in Roget's Thesaurus and the "Onomasticon".

[3] It comprises 6000 entries at the moment.

cial attention is given to expressions and proverbs. Links between concepts exist at lexical level introducing, in this way, relations among words in different concepts. There is no actual typology of these relations which remain implicit to the user. Very much like Roget's, all the words in the conceptually organized part of the Onomasticon are also listed in alphabetical order in the second half of the book. Each word is indexed for the set of concepts it belongs.

In EKFRASIS we understand "conceptual" organization as the result of the interplay of a set of domain relations. In addition, EKFRASIS is planned to help with the usage of words by providing definition of concepts, glosses and translation of words, usage examples and full morphosyntactic information. In our survey, we exposed the users to large amounts of information organized in more than one ways and asked them whether such a tool would be useful to them in their professional lives. Throughout the present discussion, we ask the reader to keep in mind that we aim at developing a resource that would be of use to a wide audience.

4 The Survey

Although the project EKFRASIS is addressed to anyone who writes in Modern Greek, we thought that professionals would have a clearer view of the authoring procedure and its needs.

Authors of literature	5
Editors	2
Translators	8
Journalists	6
Total	**21**

Table 1. Composition of the user group

Table 1 shows the composition of the user group. Each group of professionals works under different conditions and has different requirements. In general, journalists and translators work under time pressure while authors of literature and editors are more concerned with linguistic and aesthetic quality. In the user group, authors, literature translators and editors are well known intellectuals of the country publishing with the publishing house "Kastaniotis" (http://www. kastaniotis.com/), industrial translators work for a medium size firm (http://www.orco.gr/ loc/frameset-gr.html?

navbar-gr.html&0) and journalists work for the prestigious daily newspaper "I Kathimerini" (http://www.kathimerini.gr/).

Users were interviewed by teams of researchers and

- each of the literature authors and editors were interviewed personally

- industrial translators and journalists were interviewed in groups according to their own requirement.

To each person or group a presentation of the aims of the project was given and then, a specially developed mock-up of a couple of usage cases of the authoring tool was presented. We used a different mock-up (.ppt file) for each author and editor and for each of the journalist and translator groups because EKFRASIS is a novel application by Modern Greek standards and, since no user had some relevant experience, verbal description would not help at all. The presentations were followed by discussion and an interview that was taped and, finally, the users were asked to fill a questionnaire. Each user (author, editor, translator, journalist) filled in a separate questionnaire.

For the first part of the mock-up, pieces of text produced by each one of the authors, a piece of Greek translation from the site of Nokia and a piece from "I Kathimerini" were selected to develop the presentation that relied on the following scenario: hypothetically, when they developed the particular text, the authors experienced the recollection problem and used EKFRASIS to find a couple of words. They started their search with an input word of somehow related meaning to the intended one but not necessarily of the same PoS. We present as an example extracts from the mock-up developed for one of the authors of literature.

In Figure 1 the author uses the noun *mania* as an input word. EKFRASIS returns the names and definitions of all the concepts where the input word occurs (gray area on the left). The concepts are not necessarily related to each other. Here, the first one corresponds to '*proclivity, propensity',* the second to '*urge',* the third to '*mania'* as a disorder*,* the fourth to '*mania, passion*', the fifth to '*fury',* the sixth to '*wrath'* and the seventh to '*love'.* On the right, for each concept a set of semantically relevant words are

given, all of the same PoS with the input one (here, a noun). For instance, concept 6 is labeled *οργή 'wrath'* and the words given are *οργή 'wrath', θυμός 'anger', νεύρα 'nerves', αγανάκτηση (being indignant), μανία 'mania'.*
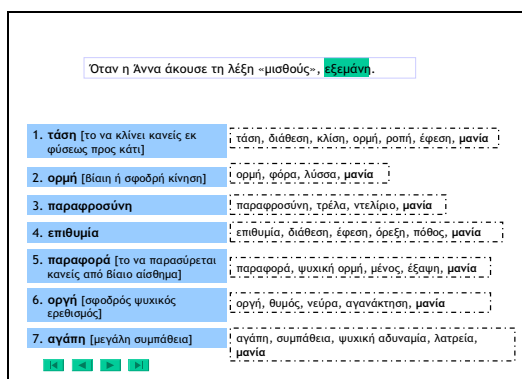

Figure1. Unrelated numbered concepts indicated with the labels on the left

In this hypothetical scenario, the user selects the 6th option (*wrath*). The screen shown in Figure 2 pops up (on the upper left corner the label is *οργή* '*wrath*').
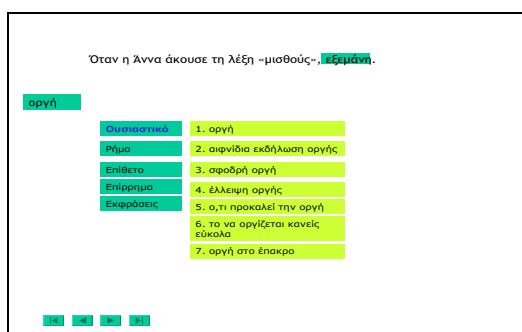

Figure 2. The right hand column consists of the set of related concepts within a PoS (noun here)

In this screen, the concepts are related to each other as they all are about *wrath*. The concepts in successive order are *'wrath', 'sudden expression of wrath', 'strong wrath', 'luck of wrath', 'what causes wrath', 'to become furious easily', 'extreme wrath'* and are listed on the right hand column. The list of PoS (noun, verb, adjective, adverb, expressions) is on the left hand column. In Figure 2, the activated PoS is 'noun', however, the user could activate any other PoS, an option he picks in Figure 4, where he activates the PoS 'verb'. In our hypothetical scenario, the user selects the 7th concept (*extreme wrath*) and receives the set of synonyms and antonyms, enclosed in the boxes in Figure 3. Antonyms are given in the box at the bottom of the screen. The user stores these findings and carries on with the PoS 'verb' (Figure 4).
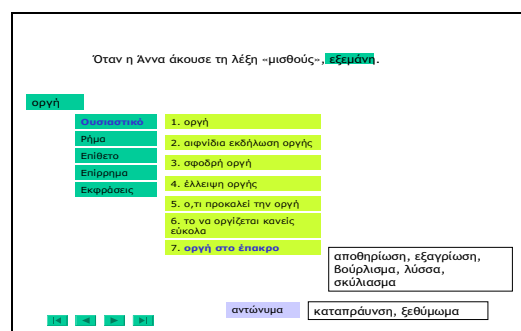

Figure 3. Synonyms and antonyms in a concept and PoS ('*extreme wrath*' and 'noun'). Words are organized in related numbered concepts indicated with the labels on the right
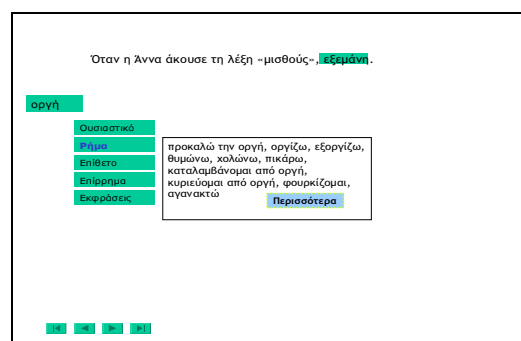

Figure 4. The PoS 'verb' for the concept '*extreme wrath*'

This PoS comprises only one concept, so the system shows the box with the lexical material. There is plenty of lexical material so the indication 'more' guides the user who would require access to more information.

Two series of user responses were elicited -- one with the questionnaire and one with the interviews. The results of the interviews were not directly measurable but they greatly helped to clarify the picture. In what follows we will present the measurable results but in the conclusions, we will draw on the interviews as well.

The questionnaire included different types of question (multiple choice questions, questions with graded answers, open questions). In this report we are interested in the parts of the ques-

tionnaire on (i) the contribution of dictionaries and spelling checkers to authoring work (ii) how authors experience the recollection problem and (iii) efficient searching for words.

5   Questioning the users

5.1   Contribution of technology and dictionaries to authoring work

We first asked if professionals used computers and authoring aids.

Nearly 100% of users worked on a computer. All users with the exception of journalists used general language dictionaries or specialized ones including dictionaries of synonyms (Table 2). Journalists, on the other hand, seemed to pay attention mainly in word spelling.

	Au-thors	Edi-tors	Trans lators	Jour-nalists	To-tal
Diction-aries (printed, digital)	5	2	6	1	14
Special diction-aries	5	2	4	0	11
Spelling checkers	0	0	2	4	6

Table 2. Usage of authoring aids

Why do users use dictionaries and spelling checkers? We asked the users to give a yes/no answer to two contradictory statements. So, to the statement "I can find easily what I look for in dictionaries and spelling checkers" all other users and 2 journalists answered "yes". However, to the opposite statement "I can not find easily what I look for in dictionaries and spelling checkers" no journalists replied while one editor and 3 authors replied "yes". So, the picture is somehow messed up but in the overall it shows that people have formed expectations about dictionaries and look for certain types of information that they more or less find. In addition, 1 editor, 4 translators, 3 authors and 4 journalists stated that dictionaries and spelling checkers speed up their work.

So, there is some kind of information in the dictionaries and the spelling checkers that helps and speeds up authoring work. Certainly, these resources provide little help with the recollection problem. So, in the next parts of the question-

naire we set out to make clear what kind of information users considered useful in the dictionaries and what else they would like to find and how. Mock-up presentations were of crucial help in this task.

5.2   Experiencing the recollection problem

We asked how often and in which way users experienced the recollection problem. Users turned out to be quite familiar with experiences such as the following: (i) looking for a synonym (ii) entertaining the belief that a word exists but not being able to identify it (iii) having a general notion in mind but not being able to find words that ground it properly (Table 3).

	Jour-nalists	Edi-tors	Trans-lators	Au-thors	Total
Synonym	1	2	6	5	14
Heard in the past	0	2	6	5	13
General notion	4	1	6	5	16
Other	0	0	0	3	3

Table 3. The recollection problem

It is clear that professional demands influence authoring behavior at work: authors of literature, editors and translators are more into searching for the appropriate word than journalists. According to the users, two are the main motives for searching words: (i) precision (ii) aesthetics (the example put forward by the users was the repetition of a word).

It is also interesting that the answers already point to some important lexical relations, namely synonymy and hypernymy / hyponymy,   which can be used for both constructing and navigating a resource (and have been used in many dictionaries, for instance in WordNet).

5.3   Searching for lexical information

Despite the fact that answers such as "heard in the past" and "general notion" (Table 3) indicate that a variety of semantic relations can be used for searching for a word, it was not easy for the users to imagine which those relations would be. This became obvious because

- users were able to fill in the part of the questionnaire on searching only after they

had seen the mock-up that presented them with searching strategies other than alphabetical listing

- although they had twice in the questionnaire the opportunity to describe some way of searching for words other than the ones suggested in the mock-up (see below) they did not do it –despite the fact that interviews lasted for about 2.00 hours each on the average.

Although they did not identify alternative searching strategies, they in the overall welcomed the possibility of using morphologically (Table 4) and pragmatically (Table 5) related words for dealing with the recollection problem.

The example given to the users for illustrating morphologically related words was the triple *adopt->adoption->adopted*. The users were asked whether they would like the dictionary to ensure that such sequences would be automatically offered.

	Jour-nalists	Edi-tors	Trans-lators	Au-thors	Total
YES	2	2	8	2	14
NO	4	0	0	2	6

Table 4. Morphological relations

A similar question was asked about domain relations with the following example: "if you type in *sell* or *seller* or *offer* would you like to be given automatic access to *buyer, client, consumer*."

	Jour-nalists	Edi-tors	Trans-lators	Au-thors	Total
YES	5	2	6	4	17
NO	1	0	0	0	1

Table 5. Domain relations

Of the relations named explicitly in the questionnaire, synonymy turned out to be the most likely one to be used for helping with the recollection problem (Table 6).

Hypernymy/hyponymy (Table 7) and antonymy (Table 8) were in the overall considered less useful for the recollection problem than synonymy, but still a high percentage voted for them.

	Jour-nalists	Edi-tors	Trans-lators	Au-thors	Total
Often	2	2	8	3	15
Occa-sionally	4	0	0	2	6
Rarely	0	0	0	0	0
Never	0	0	0	0	0

Table 6. Synonymy

	Jour-nalists	Edi-tors	Trans-lators	Au-thors	Total
Often	1	2	4	3	10
Occa-sionally	4	0	4	1	9
Rarely	1	0	0	1	2
Never	0	0	0	0	0

Table 7. Hypernymy/Hyponymy

	Jour-nalists	Edi-tors	Trans-lators	Au-thors	Total
Often	1	2	4	1	8
Occa-sionally	1	0	2	2	5
Rarely	3	0	2	2	7
Never	1	0	0	0	1

Table 8. Antonymy

Next, users were asked how they would like to see information presented (Table 9). They were offered mock-ups of the following four choices:

	Jour-nalists	Edi-tors	Trans-lators	Au-thors	Total
A	4	0	0	1	5
B	0	1	2	1	4
C	2	1	4	1	8
D	0	0	2	2	4

Table 9. Presentation of information (a)

- **A**. All linguistic material pops up in strict alphabetical order only (no PoS or semantic classification)

- **B.** Only the linguistic material in the same PoS as the input word pops up in alphabetical order

- **C.** All linguistic material pops up in the form of a semantic tree[4] together with PoS information—the tree reflects the conceptual organization of the dictionary

- **D.** Only the part of the tree that belongs to the PoS of the input word pops up

In fact, options A and C are opposed to options B and D in that the first pair offers immediate access to the whole lot of the related lexical material while the second pair only to the semantically related words in the same PoS with the input word---practically, its synonyms. In Table 9.a. we sum the answers according to this division. While the A&C option was preferred by 62% of the users, the fact that a good 38% has chosen the B&D option had to be taken into account.

	Jour-nalists	Edi-tors	Trans-lators	Au-thors	Total
A&C	6	1	4	2	13
B&D	0	1	4	3	8

Table 9.a. Presentation of information (b)

A compromising solution to this split of requirements is to present first the minimal necessary information, practically the synonyms of the input word, and then allow users navigate through the whole lot of it.

Organisation of information in the form of a 'semantic tree' seems more popular than simple alphabetical presentation of material. Still, some users prefer information to be presented as it always had, in alphabetical order, without any other complication.

5.4 More information of interest

	Jour-nalists	Edi-tors	Trans-lators	Au-thors	Total
Often	1	2	2	4	9
Occ/ly	1	0	4	0	5
Rarely	4	0	2	1	7
Never	0	0	0	0	0

Table 10. Expressions

The recollection problem concerns both one word units and expressions or collocates as is clearly indicated in Table 10 and Table 11. The question asked here was "How often do you look for an expression / a collocate?".

We must note here that, ahead of its time, Onomasticon puts special emphasis on both types of information. Usage examples (Table 12) were requested mainly by translators and authors while glosses (Table 13) turned out to be of medium interest.

	Jour-nalists	Edi-tors	Trans-lators	Au-thors	Total
Often	1	1	6	3	11
Occ/ly	5	1	0	0	6
Rarely	0	0	2	2	4
Never	0	0	0	0	0

Table 11. Collocates

	Jour-nalists	Edi-tors	Trans-lators	Au-thors	Total
Often	0	1	4	2	7
Occa-sionally	1	0	4	1	6
Rarely	1	1	0	2	4
Never	4	0	0	0	4

Table 12. Usage examples

	Jour-nalists	Edi3t ors	Trans-lators	Au-thors	Total
Often	0	1	2	1	4
Occa-sionally	3	0	4	2	9
Rarely	2	1	2	2	7
Never	1	0	0	0	1

Table 13. Glosses

On the other hand, users were interested in inflection (Table 14) and spelling (Table 15) information, as well as "the right context of usage" (Table 16) of words or expressions.

	Jour-nalists	Edi-tors	Trans-lators	Au-thors	Total
Often	4	1	4	4	13
Occ/ly	0	0	2	1	3
Rarely	2	1	2	0	5
Never	0	0	0	0	0

Table 14. Inflection

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[4] 'Semantic tree' is a description of the situation in Figure 2 where words are organized in concepts indicated with the labels on the left hand column).

This comes as no surprise because Modern Greek reflects the long history of the language in several, often confusing ways:

- by providing more than one spellings for a word, eg *μείγμα / μίγμα* (*mixture*)

- by being heavily inflected with many types for the same set of PoS and grammatical features, eg

έτρωγαν, τρώγαν, τρώγανε
eat – 3rd, plural, past continuous

Furthermore, the different forms are related with different styles, for instance in the example above the first form is considered the standard and the last the colloquial one.

	Jour-nalists	Edi-tors %	Trans-lators	Au-thors	Total
Often	3	0	6	1	10
Occ/ly	1	0	0	1	2
Rarely	1	2	2	2	7
Never	0	0	0	0	0

Table 15. Spelling

	Jour-nalists	Edi-tors	Trans-lators	Au-thors	Total
Often	4	0	6	3	13
Occ/ly	0	0	2	1	3
Rarely	1	1	0	1	3
Never	1	1	0	0	2

Table 16. Right context of usage

Naturally, editors need the particular facilities less than the other groups given their specialty.

6 Conclusions and decisions

The professional occupation of the users seemed to determine the kind of available authoring aids they preferred. This may be due to the fact that they work under serious time pressure. However, they too experienced the recollection problem and would take advantage of domain relations to solve it. Editors require the least normative and usage information. Authors and translators seem to appreciate all types of information. Translators also stressed that efficient presentation of information is important, probably because they use translation aids regularly.

On the basis of the questionnaire and the interviews, we conclude that the features of the dictionary that would be attractive to the majority of users are:

- **Easy access to limited but to-the-point lexical information**: the most usable synonyms and the most useful derivatives

- **Access to rich semantic information must be provided** to those interested, although at a second step. **Users are more interested in the lexical material than the labeling of semantic relations**

- **Categorisation of lexical material by PoS**. The PoS of the input word pops up first but all the other PoS in the same concept are available

- **Easy access to normative information** given the particularities of Modern Greek in morphology and syntax

On the basis of the above general conclusions, EKFRASIS interface design would satisfy the following minimum requirements:

- All concepts to which an input word belongs are shown at the first step of the search, together with the synonyms of the word in each concept

- Once a concept is selected, all existing sub-concepts are presented

- If no sub-concepts exist, all PoS in a concept are made available to the user who sees the concept definition and the set of synonyms for each PoS (if they exist)

- Once a word is selected all material about it pops up: gloss, example of usage, lexical relations, inflection, syntactic properties, collocations, translation

Figure 5 is an extract from a mock-up where the hypothetical user has retrieved the multiword expression *φέρνω στο φως* '*bring to light*'. Information given includes: gloss, synonyms *('present', 'give away', 'make something visible', 'make something obvious')*, inflection information (concerning tense formation) and hints on its the usage. Users agreed that for each word an exhaustive summary of its properties should be provided.

Figure 5. Presenting words

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