ISSA Proceedings 2002 – A Multidimensional Analysis Of French Modal Verbs Pouvoir, Devoir And Falloir

Introduction

Every utterance can be, traditionally, analyzed into two main components: the *dictum*, and the *modus* – i.e. the propositional content (dictum) expressing the information conveyed by the utterance, and the way it is expressed (modus). Modal expressions are the most explicit means by which this modus is achieved. Linguistically, they fall under a large number of grammatical categories: modal auxiliaries (*can, must...*), verbs of opinion (*think, believe...*), adjectives (*probable, necessary...*), adverbs (*possibly, certainly...*). But, beyond this syntactic variety, they share essentially the same semantic properties, namely:

1) to mark the speaker's commitment to his/her assertions; what Grize (1983) calls *prise en charge*;

2) to open a set of possible worlds, and to define routes among them; a process which involves a momentary disengagement (what Culioli calls *décrochage*) from the current representation.

As such, they represent an important tool in argumentative processes, which are essentially a matter of beliefs and of transformations of these beliefs.

Apart from studies on modal logic (which, as we will see, are not really relevant for our purposes), there are a large number of linguistic studies on these terms (to quote only relatively classic studies,see, e.g., in English, Perkins 1983; in French, David & Kleiber 1983; and, for the particular verbs we will study here, Portine 1983 or Fuchs 1989). However, this category of linguistic devices have been poorly studied by psycholinguists, who have, by and large, neglected their specific import in sentence and discourse representation. This neglect is, for a large part, due to the kinds of approaches to lexical semantics which are commonly used in the psycholinguistic tradition. It does not seem easy to represent the meaning of modals in the conventional style of semantic networks –

which is the most common approach of meaning in psycholinguistics -, nor, more generally, in the prevalent truth-conditional conception of meaning: indeed, most of psycholinguistic models are essentially conceived for dealing with a referential conception of meaning. And the problem with modal expressions is that they simply *do not* refer in the usual sense. Of course, the 'possible worlds' theory of Hintikka (1969), for example, does deal with modal expressions as referring to some kind of objects; but it is definitely not plausible as a psychological model (cf. Johnson-Laird, 1978). So, the general trend is to consider these terms as belonging to the 'logical' component of the utterances, together with connectives and quantifiers. A solution which is equally unsatisfactory in each of these cases, since a common feature of these terms is their polysemy: according to the contexts in which they appear, they take on a variety of values, that cannot be reduced to the logical operators they are supposed to represent (concerning the connectives, see, e.g., Caron 1997). In order to account for this polysemy, the most promising way is, in our view, to rely on some kind of 'procedural semantics', which has already proved useful in understanding the meaning of connectives (cf. Caron, 1996, 1997). The general idea is to conceive the meaning of a given term as based on a relatively abstract 'meaning schema', which gives rise, according to contextual parameters, to various 'sense effects'. This 'meaning schema' has to be understood as a set of procedural instructions, controlling the hearer's construction of the discourse representation, and reflecting the speaker's operations in constructing his/her own representation.

The aim of this paper is to present, in the frame of this hypothesis, an analysis of the three most frequently used French modal verbs: *pouvoir, devoir,* and *falloir*. The first of these verbs expresses the possibility and can be considered as corresponding, in English, to the two modal auxiliaries *can* and *may* (but also *to be able to*, etc.); the two others express necessity: *devoir* can be translated by must (*should, have to ...*), and *falloir*, which is an impersonal verb (*il faut que...*) corresponds approximately to *it is necessary that... .* But each of these verbs is, as will be shown below, highly polysemous (as are also, indeed, their English counterparts). Of course, the correspondence between French and English verbs is a very loose one, and the results we will present are, in part, valid for French language only. But we think that the conclusions which can be drawn from them, and the method of analysis, have a more general significance.

Method

Our aim was not to undertake a more or less intuitive analysis, nor to develop a purely linguistic study of the meanings of these terms, but to try to determine what are the psychological processes to which they correspond, i.e. the representations and cognitive operations of human subjects when dealing with them. So, we attempted to gather experimental data on the way normal French-speaking subjects understand these verbs.

For each of the three verbs (*pouvoir, devoir, falloir*), a list of 20 sentences was constructed, illustrating a large sample of the different values of these verbs. The three lists are presented in the Appendix.

Two tasks were achieved on each of these lists, by groups of 60 subjects each (French-speaking adults):
– First, they were asked to sort the sentences into classes, on the basis of the similarity of meaning of the modal verb – that is, to put together the sentences where the modal verb seemed to have the same meaning, or at least a similar meaning. So, for each couple of sentences, we obtained a measure of their similarity, given by the number of times the two sentences had been put into the same class: from 60 (when all the subjects had put them together), to 0 (when no one did).
– Secondly, they had to provide a paraphrase of each of the sentences, without employing the modal verb.

Starting from these data, we could obtain:
a. from each matrix of similarity, a hierarchical analysis, giving a small number of clusters representing the main senses (or classes of senses) of the verb;
b. from these same matrices, a multidimensional analysis, defining two or three main factors intervening in the construction of the meaning of the verb;
c. from the typology of paraphrases, a "profile" for each verb, which could then be incorporated into the multidimensional analysis (as secondary variables), and provide a basis for the interpretation.

Figure1 gives an example of the results, showing the first two axes provided by the analysis of pouvoir, the clusters of sentences, and the types of paraphrases (symbolized by triplets of letters, such as AQN = adverbs of quantity, *VAV* = verb "avoir" [to have], etc.).

Figure 1

Pouvoir

PLAN 1 2 AXE 1 HORIZONTAL (35.1 %) AXE 2 VERTICAL (18.9 %)
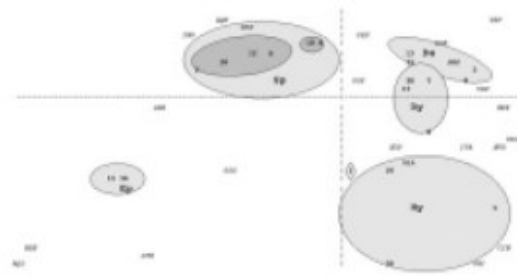
Figure 1

Results

The dimensions of this paper do not permit to give a detailed report of these analyses. So, we will only give a brief overview of the results, with a more detailed commentary on the data presented in Fig.1, in order to give an idea of the method of interpretation.

(a) *Pouvoir*

To begin with, a hierarchical analysis on the matrix of similarity of the 20 sentences with pouvoir yielded five main clusters among which these sentences could be distributed (see the Appendix to find the repartition of sentences into clusters):

– A first cluster obviously corresponds to the sentences where pouvoir has its dynamic (or radical) meaning, expressing a physical ability (translatable by *be able to*), as in *je peux soulever cette valise* (I can raise this suitcase); we will note it as 'dynamic' (Dy);

– In the second cluster, the meaning is clearly epistemic (Ep), expressing an opinion that the speaker presents only as probable, without fully asserting it, as in *il pouvait être minuit quand l'incendie se déclara* (it could be midnight when the fire declared);

– A third cluster can be interpreted as 'sporadic' (Sp) – borrowing the term from Kleiber (1983): the modal verb expresses here a fact that can be encountered at different moments of the time, or in various circumstances, as in: *il peut arriver que je fasse une erreur* (it may happen that I make an error), or *la vie peut se présenter sous forme végétale ou animale* (life may appear either in vegetal or in animal form); it is intresting to observe that two sentences (4 and 10: cf. Appendix), whose meaning entails rather a suggestion (*On peut demander aux*

gens... [we may ask people...]) are found in this same cluster.

– The fourth cluster clearly gathers the sentences where pouvoir has a 'deontic' sense (De), i.e. expresses a permission: *les élèves peuvent sortir jusqu'à 18 heures* (pupils may exit until 6 o'clock);

– Finally, in the fifth cluster, we find sentences where the modal verb refers to an event which is considered as possible in the future, such as *il peut bien venir me voir, je ne lui parlerai pas* (he can well come to see me, I will not speak with him). We will note them as 'hypothetic' (Hy).

Three main factors can be retained (representing respectively 35.1 %, 18.9 % and 15.2% of the overall variance). Their interpretation has to rely, first, on the nature of the clusters which are opposed on each axis, and secondly, on the distribution of paraphrases.

1. The first axis is the most important, since it represents more than one third of the overall variance. It contrasts the epistemic (Ep) and sporadic (Sp) senses, on the one hand, and the deontic (De), dynamic (Dy) and hypothetic (Hy) on the other hand. In the first case, we find essentially paraphrases with adverbs marking quantity (AQN, such as *quelquefois* [sometimes]), or qualitative proximity (AQL: *environ* [about]); it is also there that one can find the greatest number of simple suppressions of the modal (*000*). The most frequent paraphrases, in the second case, use verbs *être* (to be) and *avoir* (to have) (*VEP and VAV*). In other words, in the two first clusters of sentences, the meaning of the modal seems to rely on the representation of the (possible) state of things referred to, in so far as it is related to a set of other objects; while in the three other clusters (on the right part of the graph of Fig.1), it implies the consideration of some properties of the referent itself.

2. The second axis contrasts sporadic (Sp) and deontic (De) senses, on the one hand, with epistemic (Ep) and Hypothetic ones (Hy) on the other hand; it is neutral relatively to the dynamic (Dy) sense. The paraphrases massively correspond, in the first case, with impersonal verbs, of modal (*IMO: il est possible* [it is possible]), or existential value (*IEX: il y a* [there is/are]), or at least with verbs at the third person; and in the second case with verbs at the first person (JPN: verbs of opinion, such as *Je pense, je crois* [I think, I believe], or performative *JAC*, such as *je souhaite* (I wish]).

3. Finally, the third axis (not represented in Fig.1) reflects an opposition between

deontic (De) and dynamic (Dy) uses of pouvoir; it is neutral relative to the other values. The paraphrases involve, in the first case, either the passive voice, or verbs of authorization (*permettre* [to allow]); in the second case, verbs of will (*vouloir*, [will]).

How shall we interpret those data ? Our assumption is that the French verb pouvoir conveys a double operation: first, to assume a set of possible states of things: *P*; and secondly, to point on one element of this set: *p*. (The notion 'possible' has not to be defined: we shall consider it as a primitive). On the basis of this operation, a number of senses can be constructed, according to contextual parameters. It is these senses that are defined by the three factors defined above:

1. The first (and most important) factor can be interpreted as reflecting the mode of construction of the modal value: in the first case (Ep, Sp), it relies on a scanning of *P*, leading to the extraction of the element *p*; in the second case (De, Dy, Hy), it begins with an evaluation of *p*, entailing its insertion into *P*.
2. The second factor clearly seems to refer to the source of knowledge of the set of possible states or events(i.e. of set P): either it is present in the situation, and simply found in it (Sp, De), or it is considered by the subject, and constructed by him (Ep, Hy).
3. Finally, the third factor can be interpreted as referring to the source of the constraints that determine the inclusion of element *p* into the set of posible states: either this source is social (De), or natural (Dy).

Devoir
The same method of analysis has been applied here. Without entering into details, we will only give an overview of the results.

The hierarchical analysis yielded three clusters, which can be defined as:
1. epistemic (Ep): *Si la lumière ne s'allume pas, l'ampoule doit être grillée* (If the lamp does not light, the bulb must be burnt out): the verb expresses here an opinion which is presented as simply probable, but that will be endorsed in the discourse (or action) which follows (which is not the case with epistemic pouvoir, which does not imply a commitment of the speaker : an utterance with devoir can be followed by *donc* [therefore], with *pouvoir* it cannot).
2. deontic (De): *Tu dois t'acquitter de tes dettes* (You have to discharge your debts); the verb expresses here an obligation.
3. predictive (Pr): *ça devait finir comme ça* (It had to come to such an end); here,

the verb presents an event as the inevitable consequence of a given state of things.

It is interesting to observe that, on logical grounds, the three categories are not fully homogeneous. First, the 'deontic' sense of cluster 2 brings together sentences which clearly express an obligation (as in the example above), but also expressions of logical necessity (as in sentence 3 – see Appendix), or even of simple intention (as in sentence 13). As for the third type of sentences, while it could be put, logically, in the 'epistemic' category, our subjects clearly chose to give them a specific status – taking into account, together with the problematic nature of the event referred to, its temporal dimension ('future in the past', as in the example above, but also future relative to present time, as in sentences 4 or 7 – see Appendix).

On the basis of the data, we propose to interpret Devoir as expressing the selection of one possibility, with exclusion of the others. In other words, Devoir presupposes pouvoir : it implies a first step of construction of the set of possible states (implied in the construction of the meanings of pouvoir), the selection of one element of this set (again, like pouvoir), and then, an operation of exclusion, ruling out all possibilities but one. Thus, rather than expressing logical necessity – what could hardly account for the epistemic and 'predictive' senses -, it refers to an operation of decision-making, which can easily explain the three senses described above.

Two main factors can be retained (accounting for respectively 24.4 % and 16.8 % of the variance):
1. The selection can be considered, either from the point of view of the activity that produces it, or as the result of this activity. The first factor accounts for this duality of points of view: deontic sentences (De) focus on the result of the selection, epistemic and predictive sentences (Ep, Pr) on the act of selection.
2. The second factor concerns the source of the selection, which may be the subject himself (Ep), or the constraints of the situation (De, Pr).

Falloir
What emerges from the data is that falloir expresses the perception of a constraint : a given event, or activity, or state, is determined by something else, which may be an explicitly formulated condition, or the general course of the world.

The hierarchical analysis yields four clusters:
– goal-based constraint (Go): *Pour que le vin soit bon, il faut un été sec* (A dry summer is necessary to have a good wine)
– situation-based constraint (Si): *Il faut s'arrêter de travailler, car il est tard* (We must stop working, because it is late)
– necessity (Ne): *Il faut accepter ce qu'on ne peut éviter* (It is necessary to accept what one can't avoid)
– fate (Fa): *Il faut toujours qu'on me téléphone quand je suis occupé* (Somebody has always to call me when I am busy !)

Three main factors (resp. 42.8 %, 26.2 % and 10.8 %) can be defined from the multidimensional analysis:

1. the constraint is specific (bearing on current activity: Go, Si) or general (intrinsic necessity: Ne, Fa); in other terms, it comes either from a particular condition, or from the general order of the world. Each of these two cases is, in turn, differentiated by the two other factors :
2. constraints can be understood, or not (necessity Ne *vs* fate Fa); in the first case, they rely on reasons which could be made explicit ; in the second case, there is no reasonable explanation.
3. constraints are subjective (derived from goals Go), or objective (derived from situation Si).

Conclusion
A first conclusion that can be drawn from these results is that the linguistic functioning of modal verbs has not much to do with modal logic. Pouvoir does not correspond to the pure modal operator of possibility, but develops a number of operations, on the basis of the construction of a set of possible states. Devoir is not – as it is in modal logic – the symmetric term relative to pouvoir: it presupposes the construction of a set of possible states of things, operates a selection among them, and excludes all elements but one. And falloir, which would be logically equivalent to devoir, shows a completely different pattern of meanings: it sets up a relation of dependency between the state or event described and the conditions in which it happens. Thus, each one of these three verbs expresses, not a formal logical operation, but a set of instructions to construct a psychological representation.

Considering these verbs as procedural instructions, leads to a second conclusion.

Argumentation is not only a matter of propositional contents, and of logical operations on them; it is also a matter of language. And language must be conceived, not as a simple means of conveying information, but as an effective tool for interaction. From a psychological point of view, linguistic devices can be conceived as processing instructions for information given in the course of discursive process; and the hearer's cognitive representation is controlled by those instructions (as could already be shown in the case of connectives – Caron, 1997). So, there is no doubt that they play a role in argumentative processes. To speak is not only to convey information: it is also – and perhaps essentially -, as Austin suggested it, " to do things with words ": not only at the level of social conventions and rules of the 'language game', but in a concrete manner, by triggering cognitive processes in the hearer's mind.

Coming back to our data, it must be said that the limitations of the present work are obvious. First, there are, for each of the three verbs under study, a number of 'shades of meaning' which have not been considered (see, e.g. the various examples in Portine 1983). Moreover, the number of sentences in each list, which the experimental constraints inevitably limits, is, of course, very low; and the particular choice of the 20 sentences may have introduced a bias in the subjects' decisions, which could have been different with another sample. However, the results are, globally, sufficiently coherent to warrant the general conclusions we expressed above.

Another limitation – which can hardly be avoided – comes from the fact, already mentioned at the beginning of this paper, that our results are only valid for French language, making problematic a generalization to other languages. There is no doubt that *pouvoir, devoir*, and *falloir* behave differently from *may or can*, *must, should* or *have to* (or from similar terms in German, Russian, and so on). It would be too easy to argue that most of the psycholinguistic (and even linguistic) studies which are often presented as evidence for the general linguistic competence of human subjects, usually rely on a single language – namely on English data. Suffice it to say that analogous studies are needed on a variety of languages. But there is no doubt that similar observations could be made on the modal verbs of other languages, which show the same variety of meanings. It can be expected that those terms will reveal basic features relatively invariant across languages – as we could already show it in the case of the conditional if in various languages (Caron & al., 1987). More generally, the approach we illustrated here

seems to offer a promising way to study the psychological semantics of this kind of terms (and perhaps more generally, of all lexical items). As we formulated it elsewhere:

"A given word does not 'contain', or 'point to' a variety of predetermined meanings (...). What the word conveys is not, strictly speaking, a 'meaning', but a pattern of procedures which, in a given context, will produce a particular 'sense effect'. It is only those 'sense effects' that are consciously available; the procedural pattern – which I have proposed to call 'meaning schema' – is not: it has to be inferred from empirical data." (Caron, 1996, 16)

Thus, what we propose is to consider words and utterances, not as containers of thoughts, but as tools for making sense. The variety of senses a word can create are not inherent to it, they are the product of the operations this word triggers on a particular representational context. And there is no doubt that these operations play an essential role in argumentation.

Appendix: Lists of sentences used in the experiment
(The sentences have been re-ordered according to the clusters yielded by the hierarchical analysis – see text for explanation)

Pouvoir
I (Dy)
17. Dès que vous pourrez, venez me voir à mon bureau (*As soon as you can, come and see me at my office*)
20. Chacun se logeait où il pouvait (*Everybody took lodgings where he could*)
8. Qu'est-ce que je peux faire pour vous ? (*What can I do for you ?*)
7. Je peux soulever cette valise (*I can raise this suitcase*)

II (Ep)
11. Il pouvait être minuit quand l'incendie se déclara (*it might be midnight when the fire declared*)
16. Cet enfant pouvait avoir au plus six ans (*This child might be six years old at most*)

III (Sp)
2. Il peut arriver que je fasse une erreur dans mon raisonnement (*it may happen that I make an error in my reasoning*)
18. Des hommes habiles dans l'analyse peuvent être privés d'imagination (*Men

skilled in analysis may be deprived of imagination)

12. L'artiste peut ne faire qu'un avec l'exécutant (*It may happen that the artist and the executant are the same*)

6. La vie peut se présenter sous forme végétale ou animale (*Life may appear either in vegetal or in animal form*)

4. On peut demander aux gens de faire une pétition (*We could ask people to make a petition*)

10. En utilisant cette stratégie on peut contraindre l'ennemi à capituler (*Using this strategy could force the enemy to surrender*)

IV (De)

13. Le séminaire est suivi d'un débat où chacun peut s'exprimer librement (*After the seminary, a debate takes place where everyone may freely express himself*)

15. Le mineur peut contracter mariage dans certains cas (*Teenagers may marry in some cases*)

3. Les élèves internes peuvent sortir jusqu'à 18 heures le mercredi (*Pupils may exit until 6 o'clock*)

9. Christine peut faire n'importe quoi, sa mère ne lui dit rien (*Whatever Christine may do, her mother doesn't say anything*)

V (Hy)

14. Qu'est-ce que ça peut te faire ? (*Whatever can it be to you?*)

19. Il peut bien venir me voir, je ne lui parlerai pas (*He can well come to see me, I will not speak with him*)

5. Puis-je te faire remarquer qu'il est déjà six heures? (*May I point out to you that it is already 6 o'clock?*)

1. Puissiez-vous réussir! (*May you succeed!*)

Devoir
I (De)

1. Je dois rédiger le rapport d'activité pour demain matin (*I have to write the report for to-morrow morning*)

6. Tu dois t'acquitter de tes dettes le plus vite possible (*You have to discharge your debts as soon as possible*)

13. Je dois les rappeler un peu plus tard (*I have to call them a bit later*)

11. Je dois reconnaître que j'ai eu tort de m'emporter (*I must admit that I shouldn't lose my temper*)

16. Un tel incident ne doit plus se produire (*Such an incident must not happen*

again)

3. Un nombre premier doit être impair (*A prime number must be odd*)

II (Ep)

20. Si mon raisonnement est correct, le coffre doit être enterré ici (*If my reasoning is right, the chest must be buried here*)

14. Si la lumière ne s'allume pas, l'ampoule doit être grillée (*If the lamp does not light, the bulb must be burnt out*)

2. Tu dois être fatigué après ce long voyage (*You must be tired after this long journey*)

19. Les choses ont dû se passer de cette façon (*Things must have happened this way*)

9. Il doit bien y avoir quelqu'un qui est au courant! (*There must be somebody who is informed!*)

15. Je devais avoir à peu près quatorze ans quand j'ai fait sa connaissance (*It must be when I was fourteen that I became acquainted with him*)

17. Ces animaux devaient déjà exister à l'ère tertiaire (*These animals must already have existed in the Tertiary era*)

III (Pr)

8. En 1769 naissait à Ajaccio celui qui devait devenir l'empereur Napoléon Premier (*In 1769 was born in Ajaccio the man who was to become Napoleon I*)

12. C'était une croyance universelle au Moyen Age que le monde devait finir en l'an 1000 de l'Incarnation (*In the Middle Ages, everybody believed that the end of the world had to happen in the year 1000*)

5. Ça devait finir comme ça (*It had to come to such an end*)

7. Si cela devait se produire un jour, je ne le supporterais pas (*If that had ever to happen, I would not tolerate it*)

18. La nuit semblait devoir ne pas finir (*It seemed that the night should not finish*)

10. Quand il m'a quitté, il devait passer vous voir (*When he left me, he had to meet you*)

4. L'exposition doit s'ouvrir dans cinq jours (*The show must open five days hence*)

Falloir

I (Go)

1. Il faut que j'aie la maîtrise pour m'inscrire en DESS (*I have to obtain my MA degree to be registered in DESS*)

3. J'ai reçu une proposition d'emploi aux USA, mais il faut que j'obtienne le visa

d'entrée (*I have been offered a job in the US, but I have to get my visa*)

14. J'ai ma carte bleue, mais il faut que j'attende mon code (*I have my credit card, but I have to wait for my code*)

11. Pour que le vin soit bon, il faut un été sec (*A dry summer is necessary to have a good wine*)

18. Il faut s'arrêter aux feux rouges (*One has to stop when traffic light is red*)

II (Si)

10. Il faut que je prépare le repas, il est midi (*I must get the meal ready, it's 12 o'clock*)

13. Il faut s'arrêter de travailler, car il est tard (*We must stop working, because it is late*)

7. Depuis mon échec, j'ai perdu confiance, il faut que je me ressaisisse (*Since my failure I lack self-assurance, I have to recover*)

12. Mon avion part à 16 h., il faut que je sois à l'aéroport deux heures avant (*My plane starts at 4, I have to be in the airport two hours sooner*)

16. Martine n'arrive plus à s'en sortir, il faut faire quelque chose pour l'aider (*Martine does not manage to get out of that, we have to do something to help her*)

III (Ne)

2. Il faut accepter ce qu'on ne peut éviter (*It is necessary to accept what one can't avoid*)

4. Pour dire des choses pareilles, il faut être fou (*To say such things, one must be mad*)

5. Il faut peu de choses pour être heureux (*Few things are needed to be happy*)

9. Il faut rester calme dans toutes les situations (*One has to keep cool in all circumstances*)

8. Pierre a enfin trouvé la femme qu'il lui faut (*Peter has finally found the woman he needs*)

IV (Fa)

6. Il faut toujours qu'on me téléphone quand je suis occupé! (*Somebody has always to call me when I am busy!*)

15. Il faut que Jacques soit bien malade pour ne pas être venu à la réunion (*Since Jacques didn't come to the meeting, he must be seriously ill*)

17. Je t'attends depuis deux heures, et il faut que tu arrives juste quand je viens de partir (*I've waited for you for two hours, and you must arrive when I just left*)

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