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A PRAGMATIC ACCOUNT OF AVIATION MANUALS

Contents

Abbreviations

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B&L	**B**rown and **L**evinson

CTT	Communicative Theory of Terminology
DC	Discourse Community
FTA	Face Threatening Act
GGT	General Theory of Terminology
MM	Maintenance Manual
OM	Operations Manual
SE	Simplified English
S&W	Sperber and Wilson

1. Introduction

Specialized languages have been the focus of study since the first half of last century. Eugene Wuster, from the Vienna School of Terminology, created the General Theory of Terminology (GTT) around 1930 (Krieger, 2001:49). The GTT aimed at coining and standardizing specialized terms worldwide. For the GTT, terms were understood as units of knowledge, and not as lexical units. In addition, terms were not considered as part of natural languages, forming, according to their view, an artificial and controlled language. For the GTT, specialized languages should not be studied by linguists, who should be analysing natural languages, but rather, by professionals of each given area, i.e., the language of biology by biologists, the language of engineering by engineers, and so on.

Cabre et al (1998) were the pioneers in opposing the ideas of the Vienna School. Their main criticism is concerned with the idealized world conceived by the GTT, in which concepts (which pre-exist in relation to natural languages) are created in laboratory, and objects are labelled with supra linguistic and supra cultural values. From these criticisms stemmed the Communicative Theory of Terminology (CTT), which aims to cater for the complexity of specialized languages, comprehending a social, a linguistic, and a cognitive perspective. For Cabre et al (1998:38) specialized languages are not different from natural languages, being subjected to the same linguistic and pragmatic rules. A specialized language is a natural language used by a community of specialists in a particular field of knowledge. According to the CTT, specialized languages are studied by linguists, and, whenever necessary, with the help from a specialist of the given field.

Krieger (2001:56), who follows the CTT, points out that most studies about technical languages still have a narrow lexical focus. For the author, it is important to apply different linguistic theories to better understand how specialized languages really work. She suggests Text Linguistics, Discourse Analysis, Narrative Semiotics and Pragmatics among the areas that could contribute to the understanding of specialized languages.

Conversely, pragmatic studies have mainly focused on oral interactions and have made little use of corpus data. For Pileggard (1997), very few studies have applied politeness theories in studies of written language and of Language for Specific Purposes, in spite of representing both an interesting and very productive extension of the model. For the author, politeness results not only from the use of individual politeness strategies at the sentence level, but rather from a number of illocutionary acts 'intricatelly wound together' (ibid:224) in the text, for example, by the use of hedged presequences in directive speech acts. The author advocates that in written texts "the linguistic expressions of politeness are not only the primary vehicles of politeness, they are the only ones" (ibid:240).Written texts are deprived of prosodic and non-verbal features, therefore, the sender must verbalize all aspects of politeness he/she wishes to convey.

The objective of the present study is then to describe the language contained in aviation technical manuals under the light of pragmatics following a corpus linguistics methodological approach. I will use the concordance from the Wordsmith Tools for organizing the data. I attempt to analyse:

(1) Structures and strategies used to perform instructions;

(2) The use of hedges, or epistemic modals.

1.1 Aviation

Aviation is a wide area, so I will present some characteristics to contextualize the data.

In broad terms, aviation can be divided in two big areas, one related to manufacturing aircraft, and the other one related to conducting them. The former is usually accomplished by big manufacturers, such as AIRBUS and BOEING, among others. The latter can either be subdivided into civil and military aviation (Air Force and Regulating Agencies, such as the FAA in the USA) or activities on the ground (airplane maintenance, airport administration, etc), and activities on air (flying the airplanes, in flight service, air navigation, etc.). I would still make a distinction between professional aviation (airlines, air taxis, air schools), and amateur aviation (acrobatics, air clubs, balloons, gliders, etc).

All these areas presented above relate to each other in various ways. I shall concentrate the present assignment on the civil professional aviation, encompassing both manufacturers, more specifically, BOEING and airline personnel, namely, pilots (operations manuals) and mechanics/technicians (maintenance manuals).

1.2 The corpus

The data for this analysis come from two BOEING 737 manuals[1], a maintenance manual (MM-addressed to aviation mechanics and technicians) consisting of 42,382 words, and an operations manual (OM-addressed to pilots) consisting of 29,928 words, thus, adding up to a total of 72, 310 words. Berber Sardinha (2000) classifies it as a small corpus (up to 80,000 words). In spite of being considered a small corpus, I believe it is quite representative of this genre, which does not seem to vary widely. The patterns are apparently relatively stable and fixed. Hence, a small sample can be representative.

Both publications were written by Boeing. The authors are not mentioned, nevertheless, the responsibility for the information in the manuals falls upon the manufacturer, BOEING, which stands as an institutional author. The MM contains information required to service, trouble shoot, check, repair, and replace all systems and equipment installed in the 737-300/400/500 airplanes normally requiring such action on the line or in the maintenance hangar. In addition, it contains information on inspection and maintenance of airplane structure.

The 737 OM consists of Normal and Non-Normal Checklists. Normal checklists are used to verify that certain procedural steps have been accomplished. Only those steps that, if omitted, would have some impact on normal operations are included in the Normal Checklist section. Non-Normal Checklists, on the other hand, include information to be used by the flight crew to cope with non-normal situations. They contain steps to correct the situation or condition, as well as information for planning the remainder of the flight. These airplanes require two flight crew members, i.e., two pilots - a captain and a first officer. Each pilot calls for checklists according to their area of responsibility during the flight. Both manuals, MM and OM, have as a common aim giving readers[2] instructions and procedures related to the airplanes' systems.

1.3 The Addressees

Before describing the addressees of the manuals, I believe it is relevant to define the concept of Discourse Communities (DC). Swales (1990) defines DCs as a

group of people who link up in order to pursue objectives that are prior to those of socialization and solidarity, even if these latter should consequently occur.

The notion of DC is to be distinguished from that of speech communities (Hymes, 1974:51), in which some communicative needs, such as socialization or group solidarity, tend to predominate in the development and maintenance of its discoursal characteristics. Linguistic behaviour tends to be socially determined. While speech communities typically inherit their membership by birth, accident or adoption, DCs recruit their members by training or relevant qualification. DCs' primary determinants of linguistic behaviour are functional. An additional list of DCs' defining characteristics include (Swales, 1990:25): (a) mechanisms of intercommunication among its members- these mechanisms vary according to the community: meetings, correspondence, newsletters, internal publications, etc.; (b) specific lexis- specialized technical items are usually puzzling to outsiders; and (c) a threshold level of members with a suitable degree of relevant content and discoursal expertise- individuals enter as apprentices and leave by death or in other less involuntary ways; (d) individuals may belong to several discourse communities.

Genres are the proprieties of DCs, i.e., genres belong to DCs. A genre exhibits various patterns of similarity in terms of structure, style, content and intended audience. Genres are classes of communicative events which typically possess features of stability, name recognition and so on. I will take communicative event "as comprising not only the discourse itself and its participants, but also the role of the discourse and the environment of its production and reception" (Swales, 1990:46).

Genres can be understood as communicative vehicles for the achievement of goals/purposes. On the other hand, communicative purposes keep the scope of a genre narrowly focused, when compared to general language activities. Adapting Swales's example of recipes to the current assignment, it can be said that identifying the purpose of aviation MMs or OMs is a relatively easy task. Manuals appear to be straightforward instructional texts designed to ensure that, if a series of activities is carried out according to the prescriptions offered, a successful operation/repair outcome will be achieved.

Genres vary in the extent to which they are likely to exhibit universals or language-specific tendencies. This assertion is relevant in that the audience of both manuals is international. The airline pilots, mechanics, and technicians who will follow the manuals' instructions and procedures belong to innumerable speech communities. Thus, it is literally impossible to have a very culturally marked text. It is still important to point out that manuals have to be in English, since BOEING takes no responsibility for whatever accident or incident that may be caused due to a translation error.

The addressees of these two manuals form two distinct DCs who stand in different hierarchical positions in an airline. First, we have pilots, for whom OMs are written. In an airline company, pilots have the highest position in the hierarchical ranking. They even occupy managerial posts and take part in making important decisions. They are the most powerful group in an airline. Mechanics and technicians, who form the audience of the MM, do not hold the same power. Hierarchically, they would be closer to the bottom of the scale than to the top. Another important difference, not regarding power, but tasks, duties and place of work, is that, for pilots, following the instructions is not only a matter of being efficient, but, above all, a matter of life or death, as they are always on board the plane. Mechanics do their jobs on the ground. Still, non-native pilots tend to have a better command of the English language, as compared to mechanics/technicians.

2 Aviation Language-General Features

 A lot of effort is put into standardizing aviation language but there are very few studies which aim at verifying the language used in aviation documents. Standardization is, for obvious reasons, essential for aviation communication, since pilots and mechanics from various linguistic and

communication backgrounds will have to understand every detail in manual texts. Just a general understanding of the texts will not suffice in this context. A minor misunderstanding can cause serious damage, as has already been the case in several air accidents and incidents in which communication failure has proven to be a causal or contributory factor (ICAO, 2004).

There are two different standardized aviation languages: (a) Aviation Phraseology- which accounts for the spoken communication between pilots and air traffic controllers, and has been receiving more attention from scholars; (b) Simplified English[3] (SE), which deals with maintenance documents. An example of a SE rule is:

-One meaning, one word/ One word, one meaning- SE avoids using different words with the same meaning, and, when a word has different meanings, usually only one of these meanings is selected.

E.g. *notify*, *advise*, *inform*, *tell*

You must use tell. [4]

Grice's maxim of manner (avoid ambiguity), seems to be strongly observed. In pragmatics terms, apart from avoiding ambiguity at the word level, having one locution with possibly different illocutionary forces is also to be avoided. As was seen in the previous section, the intended audience for the aviation texts varies widely in terms of cultural background (speech communities). Therefore, what is written is to be as explicit as possible, unlike everyday English in which the correlation between the sentence (proposition) and utterance (or sentence uttered) is not always (or usually) straightforward. In manuals, the gap between what is literally said and what is conveyed is narrow, or nonexistent. Apparently, there is no implicature or gap to be bridged, since implicatures tend to be culturally marked and different speech communities could interpret the meaning and the force of the utterances in different ways. Thus, in this context, indirect language, or indirect speech acts, could give rise to pragmatic failure, i.e., failure to understand the pragmatic force of the speaker's utterance (Thomas, 1983). These rules show an explicit observance of Grice's Cooperative Principle (and all the maxims of conversation).

In spite of these "plain" characteristics, in the following sections I attempt to show that different pragmatic strategies are performed in the two manuals.

I will start with an account of instructions and will analyse deontic modals[5]and imperatives separately, followed by an analysis of hedges or epistemic modals.

3 Instructions in aviation manuals

The language used for instructions and description of procedures (most recurrent speech acts in the manuals) superficially resembles that of orders and commands. Instructions and procedures, in these data, are expressed either via deontic modal verbs (*must* and *should*) or via imperatives (in the section below).

3.1 Deontic Modal Verbs

Instructions which include the modal *must* are performed bald-on-record, without explicit mitigating devices (for example, *please*), as in the sentence below:

(1)You must do an inspection of all the tubes.

The preparatory conditions for an order/command (Searle, 1969: 64) are similar to the ones for instructions. First, the speaker should be in a position of authority over the hearer. Maybe, in the case of manuals, the speaker is not exactly in a position of authority in the prototypical sense, i.e.,

a boss, but rather, in a position of authority in terms of knowledge of the aircraft, a kind of expert power. Secondly, the hearer is able to do the action. Airline mechanics and pilots are well qualified professionals who are presumably able to carry out the tasks stated in the instructions.

As for sincerity condition- The speaker wants the ordered act done. An airplane manufacturer (through the manual writers) will only write instructions that have to be followed.

The essential condition- the speaker intends the utterance as an attempt to get the hearer to do the act. The rules have to be followed, otherwise, some problems with the airplane may arise.

Thomas (1995) has pointed out that Searle's rules do not allow us to distinguish related speech acts (ibid: 96), for example, *ask*, *request*, *order*, *command*, *suggest*, and I would include, *instruct* in this list. Unlike orders and commands that attack the hearer's negative face (Brown and Levinson-B&L, 1987), being in this way considered a face-threatening act (FTA), instructions and procedures are not FTAs, as they are performed for the hearer's own good. So, for the hearer to interpret instructions more accurately, it is better to do them baldly, without redress, in the most direct, clear, unambiguous and concise way possible. "Speaker and hearer both tacitly agree that the relevance of face may be suspended in the interests of urgency or efficiency" (B&L, 1987: 69). B&L point out that when the focus of interaction is task-oriented, face redress may be felt to be irrelevant. This task-orientation accounts for the paradigmatic form of instructions and recipes. Leech's emphasizes that (1983:84), "politeness is largely irrelevant in collaborative illocutionary functions, such as instructions". He suggests that most written discourse comes into this category.

The frequency of deontic[6] modal verbs used to perform instructions in the two manuals is shown in table 1:

	MM No. of tokens	MM- Per thousand words	OM No. of tokens	OM- Per thousand words
Must	74	1.75	11	0.37
Should	05	0.12	21	0.70

 Table 1-deontic modal verbs

Must is more widely used in the MM, with 1.75 words/1000, compared to 0.37 words/1000 in the OM. *Should*, however, has a higher frequency in the OM, with 0.70/1000 and 0.12/1000 in the MM.

Regarding the use of *must*, in the OM, out of the 11 occurrences, 9 are in the passive voice, accounting for 82% of cases, whereas in the MM there are 29 cases of *must* +passive, accounting for 39%. The other two uses of *must* in the OM do not make use of impersonal pronouns, or *you*:

(2) The captain must assess the situation and use sound judgment.

(3) Pilots must be aware that checklists cannot…

In the MM, there are 27 (36%) occurrences of the personal pronoun *you*, e.g.

(4) You must do an inspection of all tubes.

and 18 occurrences (24%) of *must* in active sentences with impersonal subjects, e.g.

(5) …additional contamination must not occur.

According to B&L (1987), one way of indicating that the speaker does not want to impinge on hearer is to phrase the utterance as if the agent were other than the speaker, or at least possibly not the speaker or not speaker alone. This strategy seems to be present in both manuals, since there are no occurrences of explicit performative verbs, such as, *I hereby order you to use the longest suitable runway*[7]- therefore the pronoun *I* is absent. However, B&L still claim that the passive, coupled with the avoidance of the pronoun *you* can be another strategy for not impinging on hearer. Syntactic choices, such as passive forms and impersonal forms, can be used to mitigate the force of messages (Nikula, 1996). The two manuals seem to be different in this way. The OM makes more use of passive forms, and does not use the pronoun *you*[8], which, in my understanding, counts as indirect strategies. Leech (1983:108) argues that "indirect illocutions tend to be more polite because they increase the degree of optionality, and because the more indirect an illocution is, the more diminished and tentative its force tends to be".

The incidence of *should*, in its deontic sense, is approximately six times higher in the OM (0.70/1000) as compared to the MM (0.12/1000%). The uses of *should* differ from those of *must* in the MM, as all the occurrences are in a passive construction without an agent:

(6) …APU bulkhead area should be checked for potential structure damage.

In the OM, *should* is used 17 times (81%) in the passive, e.g:

(7) Handle should be folded inside stabilizer trim.

The other three occurrences have impersonal subjects (without the use of personal pronouns):

(8) …the captain should clearly announce "REJECT".

On a scale of obligation, by choosing *should*, the speaker creates a scalar implicature [+>not must]. For Leech (1971), *should* differs from *must* "in the lack of confidence in the fulfillment of the happening described by the main verb" (ibid:94). He suggests that *should* in "He should pay for the broken window" is accompanied by " *.but he probably won't"*, whereas *must* in a similar utterance is associated with …*and moreover he will do so, because I say so*. Notice that this lack of confidence towards the addressee's compliance is related to the speaker's questionable status as a source of authority in his own sentence. The writer(s) of the OM, seems to have a preference for "weaker" forms of stating instructions, as can be seen in the higher use of *should*, in the reduced use of *must*, and in the absence of *you*. This might be due to unwillingness to impose on high-status pilots.

3.2 Imperatives

Imperatives are also used to give instructions. Imperatives are probably the most frequent ways in which instructions are performed in both manuals. Prototypically, imperatives are seen as performing directive speech acts, i.e., requesting action. Lately, it has been argued that mood (or sentence-type, in Levinson's terms, 1983) cannot be satisfactorily analysed as a conventional indicator of force, i.e. a speaker may intend a sentence meaning different from any of the potential forces assigned to it (Sperber and Wilson-S&W, 1998). In this corpus, however, imperatives are used in the most prototypical sense, getting the hearer to do something. They are performed bald-on-record, without any mitigating devices (B&L, 1987), e.g.:

(9) Do not use autobrakes.(OM)

(10) Do a functional test of the rudder system. (MM)

According to S&W (1998) if the hearer is manifestly in a position to bring about the state of affairs described (as happens in the pilots and mechanics' case) the utterance will have the force of something like a request, command, order or plea. These subcategories are distinguished from each other by manifest assumptions about the social and physical relations between speaker and hearer, and about the degree of desirability of the states of affairs described (S&W, 1998); in Searle's terms they would be called 'preparatory conditions'. The hearer, in context, chooses an actual illocutionary force from among the potential illocutionary forces semantically assigned to the sentence uttered. So, in this context, imperatives would be understood as having the force of instructions, or non FTAs. The use of imperatives is similar in both manuals.

4 Fuzziness in natural languages

Logicians have historically classified (declarative) sentences of natural languages as either true, false or nonsense. However, natural language sentences tend to have vague boundaries and fuzzy edges, thus, sentences will very often be neither true, nor false, nor nonsensical, but rather true to a certain extent and false to a certain extent, true in certain respects and false in other respects. (George Lakoff, 1972:183).

Lakoff refers to the words whose meaning implicitly involves fuzziness, that is, words whose job is to make things fuzzier, or less fuzzy, as hedges. Nikula (1996) points out that some writers use hedges as a synonym of epistemic modality. The author distinguishes two types of hedges:

- *approximators*, which typically focus on one word or expression and make the meaning of that expression denotationally vague, conveying imprecision: That is *sort of* blue.

- *shields*, which signal the speaker's evaluation of the truth value of the proposition as a whole, they convey uncertainty.

Although technical languages are regarded as plain and straightforward, or nearly "politeness-free" or "indirect strategy-free" type of language (GTT), fuzziness, or shields, have a high incidence in the form of modals, namely *can* and *may,* as shown in table 2:

	MM No. of tokens	MM- Per thousand words	OM No. of tokens	OM- Per thousand words
May	26	0.61	87	2.90
Can	118	2.78	07	0.23

There is an overt difference in the incidence of the two different modal verbs. In the MM *can* is over ten times more common that in the OM, on the other hand, *may* has the preference in the OM with 2.90/1000 compared to 0.61/1000 in the MM.

Can and *may* are often paraphrased by *possible* (Robin Lakkof, 1972:230). However, we may find they are not synonymous. Take the examples below:

(a)   Football players may be sex maniacs.

(b) Football players can be sex maniacs.

(c) It is possible that football players are sex maniacs.

Type (a) sentences will be used in case the speaker really did not know whether or not the statement was true. For lack of conclusive evidence, the speaker is not taking either side, then, if

it is later conclusively demonstrated that no football player ever was a sex maniac, statement (a) is, thereby, not proved false. The speaker is, thus, covered by any outcome. An epistemic like that cannot be falsified.

Type (b) sentences would be used in case the speaker knew of at least one instance in which at least one football player had acted like a sex maniac. In this case, the speaker is not open to both possibilities, but rather, stating one positively. If it could be shown that no football player ever acted like a sex maniac, (b) could be falsified.

For (b), we would have three paraphrases: -Any football player is, and sometimes isn't, a sex maniac.-Some football players are (always) sex maniacs, and some football players aren't. – Some football players are (sometimes) sex maniacs (sometimes not).

Yet, both (a) and (b) sentences could be paraphrased by (c), but what is described as possible in (a) is different from what is described as possible in (b).

The use of *May* in:

(11) Use of long range cruise *may* be appropriate.

is explained by means of scalar implicatures (Levinson, 1983:135). The speaker wishes to convey that he is not in a position to state that the stronger item on the scale holds, and indeed knows that it does not hold, and the addressee assumes that the speaker is cooperating, and therefore will not break the maxim of Quantity without warning (Levinson,1983:135). The stronger item on the scale would be the assertion: *Use of long range cruise is appropriate*.

It is conveyed that the writer(s) is not fully committed to the outcome of the possibly delivered action, so, if it turns out that the use of long range cruise was not appropriate, the writer(s) is not to be held responsible, since stating that *may*, entails *may not*. In this way, the writer (s) of the MM, seems to take a stronger point of view, and could, thus, be held responsible if no instances of the sentence below ever occur:

(12) Mercury vapors can be toxic.

Summing up, as far as epistemic modal verbs are concerned, the writer (s) of the MM uses a larger number of modal verbs that can hold him/her responsible for the statement. In the OM, *may* outnumbers both the uses of *may* in the MM and the uses of *can* in the OM. This strategy is a kind of "deresponsibilizing mechanism" (Brown, 1980:128), or a way to make the author less responsible.

5 Conclusion

Claims from the GTT, and, from the SE movement (Shawcross, 1993), try to establish strict standardizing rules to aviation technical language, with the underlying assumption that technical languages are not part of natural languages, but rather, form a separate kind of unambiguous, culturally and socially neutralized, objective system.

In other written genre, for example, business letters, many different types of politeness strategies are found, as concluded by Pilegaard (1997). If we take aviation manuals as a genre, and compare to business letters, we may, at first glance, agree with the GTT that technical language is, in fact, devoid of any kind of politeness strategies.

Conversely, and conforming to the CTT's principles (Cabre, et al, 1998), quantitative evidence in my data shows that the MM and the OM have different linguistic devices which convey different illocutionary forces:

1. The higher use of *must* in the MM
2. The higher use of *should* in the OM
3. Absence of second person pronoun *you* in the OM, as opposed to a high frequency of *you* in the MM
4. Preference for the use of *may* in the OM

Comparatively, the writer (s) of the OM has a preference for devices that either mitigate the force of the utterances used to perform instructions or that exempt the writer (s) from the full responsibility of the assertions, regarding the frequency of *may*. Holmes (1984) advocates that this information (which in case of longer passive forms, violates the maxim of quantity) frequently serves an affective function, expressing the speaker's attitude to the addressee. They express positive feelings towards the hearer or desire to increase the solidarity of the relationship (Holmes, 1984:363). More positive attitude seems to be expressed towards the pilots than towards the mechanics. It may be a coincidence, but our findings seem to suggest that the different strategies used in the two manuals match the different social status of the two DCs at stake: pilots and mechanics. Thus, technical languages may not be so socially neutral, after all.

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[1] Some sample pages of each manual are provided in the appendices.

[2] In the present paper, I shall take *reader, sender*, *hearer, addressee* and *audience* as synonymous. The same applies to *speaker* and *writer*.

[3] According to Shawcross (1993), simplified English originated in the early 1980s with the European airlines' and European airline manufacturers' determination to establish a standardized and basic form of the English language for use in maintenance documentation. Between 1981 and 1986 working groups analyzed the verbs used in Maintenance Manuals, established a list of recommended verbs, defined the writing rules of Simplified English and produced a Simplified English Dictionary including a word list of approved terms and a Guide for the preparation of aircraft maintenance documentation in the international aerospace maintenance language.

[4] Despite being beyond the scope of this paper, I believe this rule "one word, one meaning" is hard to be followed, as could be noted in the use of *do* in imperatives in the MM. It is sometimes used as a main verb as in "Do a check for low frequency engine vibrations", and sometimes used as an auxiliary verb, as in "Do not remove the orifice support tube…".

[5] According to Nikula (1996), a common way of classifying modal expressions is to make a distinction between deontic and epistemic modality. Deontic modality relates to the duties of the speaker or hearer in relation to a particular action. Epistemic modality relates to speakers' degree of commitment to the truth of propositions.

[6] For the analysis the concordance from Wordsmith Tools was used. The cases of *must* and *should* which do not have a deontic use were excluded.

[7] Although Austin (1962: cited by Levinson, 1983) suggested that explicit performatives are

specialized ways of being unambiguous about the act you are performing in speaking, they would not be appropriate, and would sound odd in this context, as we do not have a one author voice, but, rather, a whole institution performing the act. Austin suggests less explicit devices, such as mood (imperative), or sentence-type, in Levinson's term.

[8] There are no occurrences of *you* throughout the OM, nevertheless, this pronoun is used 180 times in the MM.

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