THE ROLE OF LOGIC TODAY

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Logics studies the general and universal characteristics of human thinking, and even if we don't speak or think about abstract mathematical symbols, we are using logics in everyday speech, not to mention contracts. Most modern businessmen thinks logics is "obsolete" and "unimportant", and even question the importance of teaching and learning logics. Our opinion and experience is the contrary, and this paper is to show you why.

1. INTRODUCTION

Many of today's businessmen will just wave their hand in dismissal when somebody mentions classical logic to them, giving reasons for their dismissal of it:

"Come on, what has it got to do with today? That is obsolete stuff."
"The ancient Greeks had enough time for that, but we, modern managers don't."

It is from this point of view that they question the importance of teaching and learning logic.

Our opinion and experience is to the contrary, and this presentation is to show you why.

2. MANAGEMENT AND LANGUAGE

Today "management" is becoming increasingly more important, and it does not only mean appreciation (that can be expressed in Hungarian Forints) but involves other areas (e.g. the management of human resources, the management of the environment) as well.

Therefore, it is worth the while to think about what "management" means. As a starting point we venture to say that "management is based on exchange."

There are usually two parties involved in the exchange. In the exchange, their common and individual interests are partly mutual and partly conflicting. The common objective is that the exchange takes place, *so that* both parties can be *as satisfied* with the outcome *as possible*. Their interests are conflicting in that they both want to get more value in return for what they give. The deal is struck and the exchange completed if there is a "common denominator" which is acceptable for both parties. This we could call an "agreement" (e.g. we exchange our boomerang for a flint stone).

Changing the relations within society, because of their complexity due to the development of society, exchange too, becomes more indirect and more complex.

On the one hand, the parties may no longer be each other's equals, and the weaker one is to accept less in exchange for something offered to him by the stronger one (e.g. he can only get a flint stone for two boomerangs).

On the other hand, instead of an immediate ("I give you something for something else, and we no longer are in any contact"-type) exchange we have such arrangements

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(agreements) that have future effects after the agreement is made. The passing of time becomes a significant factor, for with time, the expected situation of the contracting parties may change, and so do their interests.

If the terms of the agreement are set by the two parties either in writing or verbally, language comes into the picture; the importance of linguistically formulating these terms becomes crucial.

3. LOGIC AND LANGUAGE

Logic studies the general and universal characteristics of human thinking (the most complex system known to exist in the world).

The philosophical question, are there general and common characteristics of the way people think, but experience tells us that "for the most part there are."

Common experience is recorded and transmitted by language, and it appears in the structure of sentences. Generally, you can find the equivalents of one-variable and binary logic operations (negation, conjunction, disjunction, equivalence, implication), which we generally express using the adequate conjunctive word or sentence structure.

We believe it is important to note that the Hungarian language is unique in this respect (as in many others). Here we only cite some, but not all, representative examples.

In everyday Hungarian the same linguistic form is used to express implication and equivalence. If a mother says to her child: "ha megeszed a spenótot, kapsz tortát" (*if you eat the spinach, you will get some cake*), she is likely to have equivalence in mind: "akkor és csakis akkor kapsz tortát, ha megeszed a spenótot" ("*you will only get some cake, if and only if you eat the spinach*"). However, the child ignorant of logic could see it as an implication used the same way in everyday Hungarian ("ha megeszem, akkor kapok, de ha nem eszem meg, akkor vagy kapok vagy nem, mert anya azt nem mondta, hogy mi lesz, ha nem eszem meg," meaning "*if I eat the spinach, I will get some cake, but if I do not, I will either get some cake or not, for Mum did not say what would happen if I did not eat the spinach*" in English). Of course the circumstances, the situation, etc. can make it clear what the mother has in mind, but it is not so obvious from the rules of logic manifested in the language used. Some of the jokes made by children (i.e. infantile jokes) arise from this phenomenon.

In everyday Hungarian the same linguistic form (the conjunctive word "vagy," meaning *or* in English) is used to express both disjunction and antivalence. If a mother says to her child: "sétáltasd meg a kutyát, vagy mosogass el" ("*walk the dog, or do the washing up*"), it can mean disjunction, that is, do either this or that, or both. But it can also mean antivalence: "vagy sétáltasd meg a kutyát, vagy mosogass el" ("*either walk the dog, or do the washing up*"), that is, you have to do either one of the two, but you can choose which one you will do, you do not have to do both at once.

Further examples (of course there are many more):
- the conjunctive word "majd" ("*then*"), which usually means conjunction, but without commutativity which is so characteristic of conjunction,
- the conjunctive word "de" ("*but*"), which can mean conjunction, but antivalence as well
- the conditional with no conjunctive word ("-hat, -het", i.e. the ending or inflection expressing conditionality in Hungarian), which usually means "hidden implication."

The scope of adjectival locutions, the wrong word order, etc. may complicate the interpretation of the "literal" meaning. For example: from "piros almát és körtét ettem" ("*I ate red apples and pears*") it is not clear whether the pears were red, or when they say in the news that "tovább keresik az áldozatok és túlélők holttesteit" ("*they keep searching for the dead bodies of victims and survivors*") which is wrong, of course, but we will not think that the search is on for the dead bodies of survivors.

Therefore, the linguistic forms used in everyday Hungarian do not always mechanically reflect the logical structure.

4. AGREEMENTS AND LOGIC

To approach this we need to start with the concept of "consequence" as used in logic, according to which judgement Y follows from of judgements $X_1, \ldots, X_n$ if and only if:

$$(X_1 \& X_2 \& \ldots \& X_n) \rightarrow Y = = T$$

Xi-k are the premises, and Y is the possible consequence, the other symbols are as usual (& stands for conjunction, -> for implication, = = for equivalence, T for true).

Agreements create axiomatic systems. When talking about a specific agreement Xi-k are the judgements laid down in the agreement (logical variables). The various Ys are the statements that can be made in situations arising later on. We should consider that "real" agreements apply to events arising later on (implication). Therefore, when the parties enter into an agreement, they lay down in it their interests at the time, which may change later on (negation).

Based on the above, the "best possible scenario" is when based on the premises laid down previously by the contracting parties, later, if situations (not expected when the agreement was concluded) arise, what the consequences will be, what is a "logical" solution and what is not. This way you can decide which party is right if there is dispute between them and "how much is owed" to him by the other party because of what may or may not be his own fault.

On the other hand, implication and negation are probably the "trickiest" logical operations, as in (regardless of the language) the following:

$$P \rightarrow Q = = \neg Q \rightarrow \neg P$$

but: $P \rightarrow Q = / = \neg P \rightarrow \neg Q$

The examples given above with the peculiarities of the Hungarian language make the full understanding of consequences even more difficult, especially for those who do not know the rules of logic, or apply these rules arbitrarily.

As for the premises of axiomatic systems, logic imposes two requirements: completeness and consistency.

As for agreements, completeness means that the effects of premises should be applicable to all situations that may arise.

Consistency means that the agreement should contain no inconsistent (neither directly nor indirectly inconsistent) statements in its premises, for "from inconsistent premises anything can follow, and their opposite as well."

The structure of various types of agreement can be digested.

On the one hand, from the usual structure of the wording:
- naming the parties,
- naming the object of exchange (of either party),
- accepting current deals and future responsibilities,
- countermeasures, should either party fail to assume his future responsibilities.

The agreement stipulating (as a future responsibility) that "the buyer is liable to do something," but not stipulating how the buyer is to indemnify the other party (what countermeasures can be brought against him) if he fails to meet his responsibilities, is incomplete.

An agreement containing passages exhibiting the logical structure of

$$(P \rightarrow Q) \,\&\, (P \rightarrow \neg Q)$$

or:

$$(P \rightarrow Q) \,\&\, (\neg P \rightarrow Q)$$

is inconsistent.

On the other hand, those statements in the agreement, which are really logical expressions, can be considered judgements so the basic judgements and the logical operations (or even the quantors in them) can be digested.

The truth table evaluation often applied for the notion of consequence in logic can be performed. We determine the basic judgements contained in the premises and potential conclusions (p_i), then we draft the logical structure of premises and potential conclusion using the p_i-k and logical operations. We calculate the X_is and Y for each and every True, False (T, F) value combination of p_i-s. If the truth table has any lines where all X_is are true but Y is false, then Y does not follow from the premise, otherwise it does.

Of course, the "manual" evaluation of more than 4-5 judgements can be difficult; however, it can be calculated simply by using an algorithm. The real intellectual work is turning X_is and Y back into logical terms.

5. AGREEMENTS AND QUANTORS

In logic quantors are used to cover the presence of general (permanent) characteristics and special variances that may occur.

The universal (general) quantor ($\forall$) and the existential quantor ($\exists$) often appear in agreements implicitly. In Hungarian such statements as "minden körülmények között helytáll" ("*valid under all circumstances*") or "a jelenlegi banki kamatok 20%-ot meghaladó mértékű változása esetén..." ("*if the current interest rates should become higher than 20%*") and logically similar statements often appear in agreements.

The universal quantor can logically be regarded as the generalization of conjunction for "n" or infinite number of judgements, while the existential quantor does the same for disjunction.

Considering the future importance of negation (what will happen if something does not...), the relationship between the universal quantor and existential quantor is important.

In this area predicate calculus can help us; according to which it is practical to distinguish one-variable and multi-variable predicates. Let us just look at one-variable ones, which are to be interpreted as follows.
Given a "basic set" S, to which we can refer predicates (p) (questions that we can give a definite T or F answer to). This way for $s \in S$ p(s) will have either a T or F value, making one judgement each.

For us the "interesting" situations are those where:
$\forall s \in S : p(s)=I$ ("minden körülmények között vállalja, hogy..." meaning "*will under any circumstances...*")
or:
$\forall s \in S : p(s)=H$ ("semmiféle további követelése nincs..." meaning "*will make no further claims*").

Wrongly, many would intuitively negate such questions, e.g. negating the sentence "minden tábla fekete" ("*all boards are black*") saying "egy tábla sem fekete" ("*no boards are black*") or even "minden tábla fehér" ("*all boards are white*").

However, the rules of logic will help us. Here "S" refers to all the boards, "s"-es stand for the individual boards, "p" is the predicate, whether it is black or not.

The statement "minden tábla fekete" ("*all boards are black*") can be modelled as: $\forall s \in S : p(s)=I$.
The negation of which is: $\neg (\forall s \in S : p(s)=I) = = \exists s \in S : p(s)=H$, that is: "létezik olyan tábla, ami nem fekete" ("*there exist one or more boards that are not black*").

Therefore, we may conclude that when wording agreements it is best to avoid using sentences that logically stand for the universal quantor.

6. SUMMARY

The rules and observations of classical logic are often applied today in personal, business and managerial relations.

Using notions clearly and recognizing the basic judgements, logical operations and quantors is crucial if we want to avoid ambiguity.

For parties to co-operate effectively it is essential to "think together", and that is where classical logic can be the common denominator.

Business is characterized not only by deterministic processes but by probability as well; therefore probability logic is expected to gain more popularity.

LITERATURE

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