Cognition and Knowledge

(second supplemented edition, ver. 2.03 (en))

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Cognition and knowledge have always been objects of philosophy. This is not surprising: we ourselves as cognisers are interested in what it does mean and how to correlate what we perceive with our surrounding.

We used the system approach for the analysis of these subjects. On this way, we succeeded in the identification of the following non-mutually-exclusive types of knowledge:

- *individual (subjective),*
- *societative (objective with a new meaning) and*
- *adequate* one.

It emerged that the usage of these categories of knowledge significantly simplifies the analysis and understanding of different phenomena. We would like to particularly note the convenience of the usage of the category 'adequate knowledge'.
*It appears quite plausible that the category 'adequate knowledge' allows to dispense with using such absolute attributes like '**true**' and '**false**' regarding knowledge. Instead, we get the pair 'adequate – inadequate knowledge' into our arsenal, with a clear criterion for making a decision with regard to this.*

Our approach enabled to understand why it is so important to master the art of asking: an adeptly asked question is precisely that, what creates a cognising system, which enables getting an interesting/useful answer, i.e. enables the adequate cognition to happen.

Compared with the first edition, the current version is supplemented by chapter 'Practical Application: the Factors of Efficient Communication'.
In this chapter, the developed approach is applied to the research of factors influencing communication efficiency between humans.

Current thoughts may attract attention of an audience who is interested in philosophical topics in general and in the themes of cognition and knowledge and the systemacy approach in particular.

The current edition is published on 28.10.2017, Deutsche Nationalbibliothek,
http://d-nb.info/1142648249, urn:nbn:de:101:1-201710287025.

The original edition (version 2.0) is in Russian, issued on 28.10.2017.
Оригинал работы на русском «Познание и Знание», вер. 2.0 (ru), опубликован 28.10.2017, Deutsche Nationalbibliothek, http://d-nb.info/114264815X, urn:nbn:de:101:1-201710286933.

The manuscript of the first edition was written down in the period from 28.06. – 28.07.2014.
The original of the first edition (version 1.0) was in Russian, issued on 25.08.2014.
Оригинал работы на русском «Познание и Знание», вер. 1.0, опубликован 25.08.2014, Deutsche Nationalbibliothek,
http://d-nb.info/1056903260, urn:nbn:de:101:1-2014082511063.
The first edition in English (version 1.0) was published on 03.10.2014, Deutsche Nationalbibliothek,
http://d-nb.info/1059015641/, urn:nbn:de:101:1-2014100311377

Eine Deutsche Fassung ist geplant.

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1. Glossary

This chapter gives the main terms of the system theory [1] needed for reading this work.

System	any given entity, at which a *relation*, possessing an arbitrarily taken certain *property*, is implemented. Or equivalently: any given entity, at which some *properties*, being in an arbitrarily taken certain *relation*, are implemented.
System-constituting concept[1]	apriori given system-constituting *property* or *relation*; dependent on this, system-constituting concept is *attributive* or *relational* one, resp.
Structural factor[2]	A set of properties and relations that suffices the given system-constituting concept. Structural factor can be relational one (in the case of the attributive concept) and attributive one (in the case of the relational concept).
System substrate[3]	a carrier of relational or attributive structure.

[1] the original term by Uemov: ‘системообразующий концепт’
[2] the original term by Uemov: ‘структурный фактор’
[3] the original term by Uemov: ‘субстрат системы’

2. Definition of Basic Concepts

Let us imagine a baby who still cannot walk. Let us also imagine that baby's parents evenings light a candle for more cosiness. Owing to this tradition, the child associates the flame of the candle with a certain kind of lighting in the room.
Now, the baby has started his crawling. He is crawling towards the burning candle and trying its flame with his finger: it becomes very painful.

What has happened in the consciousness of the child at this moment? The finger, the flame and the feeling of pain – hitherto not having been associated with each other – have linked together (assembled) into one single unit, in one single system: if a finger is in the candle flame, then it is very painful. The system-constituting concept of this new system having established in the consciousness of the child is the question: 'what do I feel when my finger is in candle flame?'

Another illustrative example of cognition is the discovery of the Periodic law of chemical elements by D. Mendeleev. He grouped chemical elements, which have been scattered yet (or only partially grouped[4]), according to ascending their atomic masses. He grouped them in such a way that elements with similar chemical properties (valence, types of chemical reactions what they participate in) were situated one below the other in the same group (e.g. the noble gas group). On this way, he found out that these repeating chemical properties have certain periods dependent on the atomic masses of elements.
This new system of chemical elements having established in the Mendeleev's consciousness joined (assembled) already known and still not discovered chemical elements in a single system according to the system-constituting concept 'the elements with similar chemical properties are in one and the same group and ordered according to ascending their atomic masses'.

Generalising, let us define the process of cognition as follows:

Def. 1: The process of *cognition* is assembling (and joining) distinct elements (entities) in a single system with a certain, new system-constituting concept and structural factor, which have not been perceived yet by the given individual.
In other words, *cognition* is the process of assembling elements having hitherto seemed to be scattered, not associated with each other by a certain relation in a single system with a new (for the given individual) system-constituting concept. Thus, cognition is the creation of a new system in consciousness and/or subconsciousness.

If a new system-constituting concept have not been known not only to a given individual, but also to a community, then such cognition is often called 'a breakthrough in the given topic' or 'discovery' if this 'breakthrough' is a significant one.

Def. 1 speaks of the creation of a new system in consciousness as well as in subconsciousness without making any difference between them in the current context. It is due to the investigation approach we have chosen for the exploration of *terms* cognition and knowledge:

[4] octaves by John A. R. Newlands

for this system approach, the place of the creation and usage of a new system in the psyche of an individual does not have any significant meaning.
Of course, it is important for us and our behaviour, whether we act on subconscious or conscious level. However, in the frame of issues being considered in the current work, it does not matter, whether cognition and knowledge are subconscious or conscious.
Hereinafter, we understand 'consciousness and/or subconsciousness' upon the term 'consciousness' unless otherwise stated.

The new system, having newly formed in consciousness (i.e. having become accessible for the individual) as the result of the cognition process, is then being 'catalogued': it gets its unique 'identifier' in consciousness and is being 'registered' under this identifier in the memory of individual. The related 'record card' of this registry contains all the necessary system descriptors: the system-constituting concept (what purpose this system serves for), the structural factor (relations between the elements of the system and/or their properties) and the substrate (upon which elements the system is built).

This understanding of the process of cognition leads to a new, more abstract view on the notion 'knowledge'.

Def. 2: *Subjective (individual) knowledge*[5] is usage by consciousness and/or subconsciousness of the results of *cognition* already catalogued in the individual's memory.

Indeed, when we are saying ‚I know this', we actually communicate that we have consciously found in our memory the 'record card' with the given identifier and, if necessary, can use it.
The same concerns also subconscious knowledge: in this case, we do not say ‚I know this', but our subconsciousness also uses the cognition results already catalogued in memory.

From what has been said, it becomes apparent that the process of *cognition* (creation of new systems in consciousness) as well as the process of *knowledge*[6] (usage, by consciousness, of the systems being already known to it) represent the subprocesses of consciousness[7].

The entire variety of cognition and knowledge *forms* amounts to the variety of possible system-constituting concepts, according to which these forms of cognition and knowledge are classified. For example, such classifications as explicit/implicit, declarative/procedural, empirical/theoretical, rational/intuitive cognition and knowledge are nothing more than such a classification of cognition and knowledge *forms* according to different system-constituting concepts. This classification sequence is open, i.e. it can be continued ad infinitum, if necessary, as the set of the related system-constituting concepts is open.

[5] It is necessary to distinguish between *knowledge* (Ger.: Kenntnis), what our consciousness is indeed operated with, and *information* (Ger. Wissen) being outside the operational area of our consciousness and stored on the different types of carriers, for example, in our memory, on paper, electronic and other carriers.
[6] It deals here with individual, i.e. *subjective* knowledge, cf. also chap. 4
[7] In this context we would like to emphasise that consciousness as a whole represents neither a state nor a substance, but a **process**.
Consciousness is the process of interaction between ideality and materiality (in the form of soul and body).
From such an understanding of consciousness, the general sense of existence (of life) for all biological (self-organising) systems can be inferred: it consists in 'diversifying' the interaction process between material and ideal objects. Concretely, it happens by the creation of (ideal and material) artefacts, i.e. for human being – by his spiritual and labour activity.
However, how should this general principle be interpreted for each person individually? Individuality lies in 'diversifying', i.e. every person diversifies interaction absolutely individually, namely by creating utterly individual artefacts.

In this context, discussions among philosophers about the correctness or incorrectness of a concrete approach (e.g. objectivism/subjectivism) represent in fact a polemic about system-constituting concepts chosen by them for the description of one or another phenomenon. Obviously, a polemic about the legitimacy or illegitimacy of a system-constituting concept cannot principally be decided, as a choice of a system-constituting concept is always an *apriori* decision by researcher.
Having gone up on the next tier of abstraction and considering these different approaches as merely the usage of diverse system-constituting concepts, we come to the conclusion that all these different approaches are equivalent and of equal worth and, in this sense, legitimate. In such a way, we immediately defuse such kind of discussions.

3. Cognition as System Property

As shown above, cognition, as a subprocess of consciousness, is individual[8]. An observer (i.e. recognising subject) and the surrounding being observable (i.e. recognised) by him obviously constitute a system, i.e. the observer is actually a participant, but not an outside observer.
Two different participants in same surrounding constitute two different systems {participant + surrounding}, and a dedicated cognition process happens in each of these systems. Since the cognition process takes place in the system {participant + surrounding}, it represents **a property of the system as a whole**, but not of its single elements (cf. [3]).

Does it mean that cognition is subjective because it is individual one? And how to treat the fact that 'surrounding' exists also without any 'participant' and, therefore, cognition can be considered as objective one, as one and the same surrounding is being recognized?
Cognition is neither exclusively subjective nor exclusively objective one, but represents a process pertaining to the system {participant + surrounding} as a whole. Hence, the process of cognition dialectically unites the categories of subjectivity and objectivity.

Let us consider two different systems:

- {participant1 + surrounding0} and
- {participant2 + surrounding0},

i.e. two different participants in same surrounding.

A dedicated, individual cognition process happens in each of these systems, i.e. there is Cognition1-0 pertaining to the system {participant1 + surrounding0} and Cognition2-0 pertaining to the system {participant2 + surrounding0}. As the results of these two different cognition processes, also two different knowledges will arise: Knowledge1-0 in the consciousness of the Participant1 and Knowledge2-0 in the consciousness of the Participant2.

Let us assume, there exist means for a comparison of the content of the Knowledge1-0 with the content of the Knowledge2-0. These means for the comparison must represent nothing else than arbitrary means of communication between the Participant1 and Participant2, for example language, facial expression, gesticulation, smell etc.
In the most general case, such a comparison of the content of the Knowledge1-0 with the content of the Knowledge2-0 will lead to the following result:

[8] perception, as a subprocess of cognition, is also individual

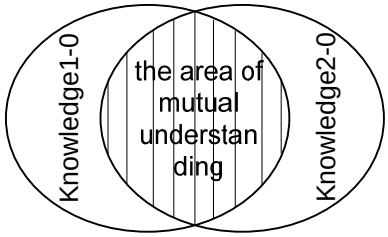

Figure 1: Scheme of the comparison of knowledge (simplified)

Def. 3: *The area of mutual understanding* is the content of the Knowledge1-0 and Knowledge2-0, concerning which the Participant1 and Participant2 succeeded to mutually achieve understanding[9] that it is a matter of the same entities.

It is apparent that the size of *the area of mutual understanding* depends on the content of the Knowledge1-0 and Knowledge2-0 (on the degree of their similarity) as well as on the means used for the communication between the Participant1 and Participant2.

One of the interesting consequences of this result is that used communication means place an upper limit on the size of *the area of mutual understanding*, i.e. **the Participant1 and Participant2 can achieve mutual understanding only as far as communication means used by them enable it**.[10]
Thus, language – as one of the means of the communication between the members of socium[11] and simultaneously as a product of this socium – necessarily limits the size of *the area of mutual understanding* within this socium on one side, and simultaneously is sufficient for preserving the unity, coherence of this socium on the other side.

Let us return to Figure 1. Remained, not dashed areas of Knowledge1-0 and Knowledge2-0 represent the areas of the *mutually non-accessible knowledge* of both the participants: the communication means used by them do not allow achieving mutual understanding in these areas.

If there are no communication means between the Participant1 and Participant2 at all, they would not principally have any possibility to compare the content of the Knowledge1-0 with the content of the Knowledge2-0, and *the area of mutual understanding* between them would be an empty set.

As an example, let us consider a situation, in which the Participant1 and Participant2 are ordinary people speaking different languages; they are also in same surrounding. For the sake of easiness, we restrict our consideration to their knowledge conditioned by simple physiological (sensorial) perceiving the surrounding. What would be their 'area of mutual understanding'?

Since the both participants are ordinary people, differences between them in the physiological perception of surrounding would be rather small, so that the contents of the Knowledge1-0

[9] DE: sich verständigen
[10] this conclusion coincides with the respective result by Ludwig Wittgenstein in Philosophischen Untersuchungen, [4]
[11] Participant1, Participant2, ..., ParticipantN

and Knowledge2-0 (concerning the sensorial perception) would mostly probably be quite similar.
What is about the means of communication? Since the participants speak different languages, a verbal communication (at least the first time of intercommunication) would be practically unfeasible. The Participant1 and Participant2 would use other communication means available to them, e.g. gestures and sounds.
Thus, their 'area of mutual understanding' would be upper-limited by the set of gestures and sounds, with whose help they would manage to understand each other that it is a matter of same entity. For example, both of them would point a finger to mouth or to belly in order to show they are hungry.

As another example, let us consider a situation, in which the Participant1 and Participant2 are people of different professions (e.g. a poet and a physicist) speaking the same language; they are also in same surrounding, e.g. they are observing a rainbow. For the sake of easiness, we restrict our consideration to their knowledge conditioned by their professional activities. What would be their 'area of mutual understanding' in this constellation?

The poet would perceive the rainbow as a wonderful phenomenon and his Knowledge1-0 would contain such elements as 'a beautiful colourful bridge levitating in the blue height and glistering in sunrays'. The physicist, considering the rainbow phenomenon professionally, would say that 'the sunlight diffracting in water drops in the atmosphere decays into its spectral components by virtue of dispersion'. This would be the content of the Knowledge2-0.

Though both the participants speak one and the same language, i.e. they share a powerful communication means, their 'area of mutual understanding' concerning the description of the rainbow within the scope of their professional knowledge would be rather small. That is because the contents of the Knowledge1-0 and Knowledge2-0 concerning their professional knowledge would be quite different (that is, the issue of professional sublanguage).

As the next example, we consider a situation, in which the Participant1 is a human being, but the Participant2 – a cat; they are in same surrounding, where there is a dog. What would be their 'area of mutual understanding'?

Firstly, there would be significant differences in the contents of the Knowledge1-0 and Knowledge2-0. These differences lie in the significantly distinct processes of the implementation of cognition by human being and cat.
Supposing that cats possess monochromatic eyesight, they would see only a black-and-white shape of the dog. Human being would see, however, the dog's shape as well as its colour.
Already this elementary distinction in the physiological perception of surrounding[12] would lead to the complete different contents of the Knowledge1-0 and Knowledge2-0 concerning 'dog's colour'.
Moreover, since the cat does not perceive the attribute ‚colour', it would miss any communication means with the human being enabling them to achieve a mutual understanding concerning the question about the 'dog's colour'.

Secondly, in such a constellation there would be significant differences in communication means available to the Participant1 and Participant2. These differences are so significant that

[12] in interaction with surrounding

the human being and the cat would hardly be able to achieve a mutual understanding even concerning the dog's shape, though they perceive it in similar ways.

Both of these factors limit *the area of mutual understanding* between human being and cat by a level determined by the means of communication between man and cat available to them, for example, concerning food, metabolism, caressing, discontent, hunting.

These examples show to us that the content of the knowledge of participants as well as their communication means may depend on same factors. Taking the example of poet and physicist, the content of their knowledge and their communication means depended on the professional peculiarities of perceiving surrounding (different professional knowings and different professional sublanguages). Taking the example of human being and cat, the content of their knowledge and their communication means depended on the physiological peculiarities of perceiving surrounding (different physiological perception of colour and cat's lack of communication means for 'imparting' colour).

Generalising, we can say that if a property or a notion cannot be perceived by Participant's consciousness, then the Participant would lack an appropriate communication means for achieving mutual understanding concerning this property or notion with other Participant.

Now, let us come back to the comparison of the knowledge of the Participant1 and the Participant2 and consider it in a more detailed way. In order to compare their knowledge, the participants have to communicate, i.e. to interact with each other. This means that they build a common system {participant1 + participant2 + surrounding0}.

From the point of view of cognition itself (and it is individual one) and of recognising participant, this system can be represented as follows: the Participant2 is obviously part of the surrounding of the Participant1 and vice versa.
From the perspective of the Participant1, the system {participant1 + participant2 + surrounding0} looks as follows:

{participant1 + participant2 + surrounding0} ->
{participant1 + (participant2 + surrounding0)} ->
{participant1 + surrounding2-0},

and from the perspective of the Participant2 so:

{participant1 + participant2 + surrounding0} ->
{participant2 + (participant1 + surrounding0)} ->
{participant2 + surrounding1-0}.

Thus, the result of cognition by the Participant1 would be Knowledge1-2-0 and by the Participant2 – Knowledge2-1-0, and the process of comparison would compare exactly these two knowledge:

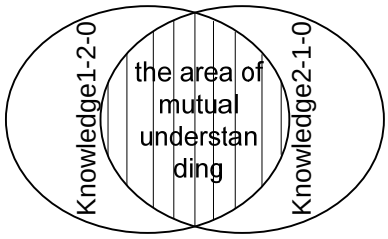

Figure 2: Scheme of the comparison of knowledge

The respective processes of cognition (Cognition1-2-0 and Cognition2-1-0), as they are individual, i.e. they happen in the consciousness of each recognising participant, are immanent in systems

- {participant1 + surrounding2-0} and
- {participant2 + surrounding1-0},

respectively. Such a representation of the initial system {participant1 + participant2 + surrounding0} indicates the recognising participant, in whose consciousness the process of cognition happens.

And what is immanent in the system in its *general* representation {participant1 + participant2 + surrounding0}?
Obviously, this is the 'area of mutual understanding' of these Participants. Indeed, exactly this area is one of the **properties of this system as a whole**.

Thus, the following three entities pertain to the system as a whole with two participants and same surrounding:

- Knowledge1-2-0 in the consciousness of the Participant1; in this case, the system is represented as {participant1 + surrounding2-0},
- Knowledge2-1-0 in the consciousness of the Participant2; in this case, the system is represented as {participant2 + surrounding1-0}, and
- 'The area of mutual understanding' Participant1$\leftrightarrow$Participant2$|_{in_surrounding_0}$ between Participant1 and Participant2; in this case, the system is represented as {participant1 + participant2 + surrounding0}.

4. Adequate, Societative (Objective) and Individual (Subjective) Knowledge

Hitherto we spoke of *individual*, i.e. of *subjective* knowledge representing one of the subprocesses of individual consciousness, see Def. 2 in chap. 1.

What does '*objective* knowledge' represent in the framework of the approach evolved above? To be able to answer this question, we firstly need to understand what is at the back of this term, of its usage by a majority of people, i.e. what the criterion of 'objectivity' of knowledge is.

Def. 4: *Objective knowledge (as this term is commonly used)* is knowledge completely depending exclusively on observation object and being absolutely independent of observing subject (participant).

However, according to Def. 2, (individual) knowledge is a subprocess of (individual) consciousness and, hence, can exist only in observer, in subject. Beside this, a full independence of the participants of cognition contradicts the affinity of cognition to the cognising system as a whole. We can infer from this that the objective knowledge – as this term is usually used – cannot exist, as there cannot be knowledge being absolutely independent of observing subject, cf. chap. 3.

Here we come back to the question already asked in chap. 3: 'How should we treat the fact that 'surrounding' exists also without a 'participant' and, hence, cognition can be considered as objective one, as one and the same surrounding is being recognized?' Does our conclusion mean that there is no objective knowledge at all and we come back to solipsism?
No, this is not to say. What does not exist is the 'objective knowledge' in the sense of Def. 4; i.e. this is nothing more than the standard usage of notion *objective knowledge* according to Def. 4 is inadequate.
But how is this notion to define in a more adequate way? In order to not interfere the 'standard' (i.e. acc. to Def. 4) usage of notion *objective knowledge* with its more adequate definition, we decided to introduce a dedicated term serving as a synonym for 'the more adequate definition of objective knowledge':

Def. 5: *Societative knowledge* is 'the area of mutual understanding' of a statistically big number of society members.

I.e. we call *societative knowledge* the area of mutual understanding (cf. chap. 3) being shared by a statistically big number of recognising participants (e.g. people). In other words, we call 'societative knowledge' such entities, concerning which a statistical big number of recognising participants achieved mutual understanding. Def. 5 virtually represents the more adequate definition of objective knowledge.

Societative knowledge is principally *societally-accessible*: it is accessible for other participants, for other society members. One can say that *societative knowledge* builds 'the common reality' amongst society members. This kind of knowledge can be transmitted on a temporary (e.g. spoken language) or permanent (written language) information carrier.

The content of *societative knowledge* hardly depends on a single subject in a given socium, because, per definitionem, this is *the area of mutual understanding* of a statistically big number of the members of this socium. This reduces to a minimum (almost eliminates) individual discrepancies between the individual opinions of subjects concerning the content of *societative knowledge*.
However, this fact is still insufficient in order to assert that societative knowledge is completely independent of the participants of observation, as it is required by the standard definition Def. 4 of *objective knowledge*. For example, the same phenomenon 'dog' is represented by two very different 'societative knowledge' by human being and by cat, cf. the example in chap. 3.

Individual and societative knowledge are apriori tantamount:

- Individual, subjective knowledge may describe an aspect of nature more adequately, as it contains not only 'the area of mutual understanding', but also 'mutually non-accessible knowledge'.
- Societative, 'societally-accessible' knowledge may be less precise, as it represents merely a subset of individual knowledge, but it has an external confirmation[13] being, per definitionem, the criterion of objectivity.

We have to stress here that *the societativity (objectivity in the new meaning of this notion)* and *the adequacy* of knowledge concerning an aspect of nature represent completely different properties; and it is despite that they very often appear as near relatives and even synonyms in societal perception.
Societativity (objectivity acc. to Def. 5) and *adequacy* are the different properties of knowledge concerning an aspect of nature, as the criteria for them are different.

The criterion of *societativity (objectivity acc. to Def. 5)* of knowledge is the existence of an external confirmation of this knowledge from other recognising participants. The procedure of an external confirmation of knowledge from other recognising participants necessarily implies a comparison of the content of Knowledge1-0 with the content of Knowledge2-0 with the content of Knowledge3-0 etc.

The criterion of *adequacy* of knowledge is the existence of an internal confirmation of this knowledge by the freedom of action[14] of recognising participant itself (of the possessor of this knowledge).

Since freedom of action is the insight into necessity[15], then

Def. 6: ***Adequate knowledge*** **is that knowledge which (originates in and) represents the result of the cognition of necessity.**
'Necessity' means here a set of properties and relations in a given system {participant + surrounding} being necessary and sufficient for the implementation of its system-constituting concept[16].

It is of an immense importance that the 'necessity' here does not require the set of all the existing/possible properties and relations in the given system {participant + surrounding}. Therefore, **an answer to the question, whether a knowledge is adequate one or not, does not require the recognition of all the possible properties and relations in the given system {participant + surrounding}, but merely of their subset being sufficient for answering this question[17]**.

[13] from other recognising participants
[14] *freedom of action* and *freedom of choice* are categorial complementarities, i.e. these notions are not equivalent to each other, see [3] and/or [Freedom, will, pride and vanity, I. Furgel]. *Freedom of action* is the insight into necessity and *freedom of choice* is the use of opportunities.
[15] (Handlungs-)freiheit ist die Einsicht in die Notwendigkeit (acc. to G.W.F. Hegel).
[16] System-constituting concept: what the participant wants to achieve in the framework of this system. If, for example, the participant wants to learn something, then the system-constituting concept would be 'determining sth.', 'observing sth.' etc.
[17] In other words, an answer to the question, whether a knowledge is adequate one or not, requires the recognition of the structural factor of the given system {participant + surrounding}

I.e. **the concrete set of properties and relations in the system {participant + surrounding}, which shall at least be known for determination, whether a given knowledge is adequate one or not, depends on the concrete statement of a question**.
If the Participant has recognised all the possible properties and relations in the given system {Participant + surrounding} and, nevertheless, cannot determine the adequacy of a given knowledge, then the concrete statement of the question is undue / inadequate in this system.

‚Necessity' in Def. 6 depends on a concrete constellation and, thus, on a concrete recognising participant as well as on the participant's concrete surrounding.
It is of equal importance to notice that, hence, the 'necessity' in no case means here determinacy, i.e. that B necessarily infers from A. If there are probabilistic properties and/or relations in a given system {participant + surrounding} (what represents the mostly expected case), then the 'necessity' would also be probabilistic one.

Whether we are using adequate knowledge or not, we feel in accordance with the degree of freedom of our action: shall an activity or undertaking come naturally to us, without substantive difficulties and permanent significant corrections, and we get the expected result, then it means that we are using adequate knowledge.

Of course, *societative (objective acc. to Def. 5)* knowledge may often be *adequate* one and vice versa. But it is not due to the equivalence of the properties 'societativity' and 'adequacy', but merely due to the procedure of determination of societativity as stated above: individual *adequate knowledge* of many recognising participants gets into the 'area of mutual understanding' of them and, thus, becomes also *societative (objective acc. to Def. 5)* one in given socium.
However, also *mutually non-accessible* parts of individual knowledge (undashed areas in Figure 1 and Figure 2) can be adequate.

Societative (objective acc. to Def. 5) knowledge can also be inadequate. The geocentric system of planets by Ptolemy serves as an illustrative example for this: this model had been representing societative, but as became clearly later, inadequate knowledge for many centuries. Difficulties of its application were univocal badges of its inadequacy.

As already shown in the previous considerations in chap. 3, *individual* and *societative knowledge*, as they are defined in Def. 2 and Def. 5, pertain to the related cognising systems as a whole[18], but not to their single elements. Since *adequate knowledge* acc. to Def. 6 can be nothing else than an individual one (and not uncommonly – also a societative one), it also pertains to the related cognising systems as a whole.

The definition Def. 6 of *adequate knowledge* can also be formulated in the following way:

Def. 6a: ***Adequate knowledge* is the result of cognition of a set of properties and relations in a given system {participant + surrounding} being necessary and sufficient for the implementation of its system-constituting concept**.
In other words, ***adequate knowledge* is the result of cognition of the *structural factor* of a given system {participant + surrounding}**.

[18] subjective knowledge pertains to the system {particiapnt1 + surrounding0}, the societative knowledge of participants (1 ... N) – to the system {particiapnt1 + particiapnt2 + ... + particiapntN + surrounding0}

If it is a matter of cognising system, i.e. of a system, in whose framework one seeks for an answer to a question, then adequate knowledge is the result of cognition of a set of its properties and relations being necessary and sufficient for answering the question asked.
Now, it becomes clear, why it is so important to master the art of asking: an adeptly asked question is precisely that, what creates a cognising system – as its system-constituting concept –, which enables getting an interesting/useful answer, i.e. enables the adequate cognition to happen.

5. Practical Application and Advantages

Now, we ask ourselves if the new categorisation of the notion 'knowledge' helped to solve some epistemological problems in a more natural and adequate way.

5.1. The Classical Knowledge Analysis

In the classical knowledge analysis, *knowledge* is defined as justified true belief:

A subject S *knows* that a proposition P is true if and only if:

(i) S believes that P is true,
(ii) P is true, and
(iii) S is justified in believing that P is true.

There arises the question: what is a ‚true and justified' proposition? What are criteria for this predicate?

If S verifies the veracity and justification of a proposition P by a comparison of his individual (subjective) belief with the beliefs of other members of socium, then the 'veracity and justification' of the proposition P is *societative knowledge (objective one in the new meaning)* acc. to Def. 5.
If S verifies the veracity and justification of a proposition P by his own experience regarding his freedom of action, when he is using the proposition P, then the 'veracity and justification' of the proposition P is *adequate knowledge* acc. to Def. 6 or Def. 6a.

Thus, the definition of the notion 'knowledge' in its classical analysis is ambiguous: this can be societative as well as adequate knowledge (and both of them simultaneously, as well). As we already discussed above, these two types of knowledge are not equivalent to each other.

5.2. Edmund Gettier Problem

Edmund Gettier considered the following case:

Smith and Jones have applied for same job. Since the employer clearly gave Smith to understand that the job would go to Jones, and Smith counted 10 coins in Jones's pocket (how he got into the pocket?), Smith therefore justifiably concludes that

(1) Jones will get the job and there are 10 coins in Jones's pocket.

Smith infers from (1) that

(2) the man who will get the job has 10 coins in his pocket.

This Smith's belief (2) is justified. However, in fact (and Smith does not know this), the following has happened: Jones does not get the job. Instead, Smith does. And Smith also had 10 coins in his pocket (unknowingly and just by chance).
That is, the proposition (2) is true, though Smith has inferred it from the wrong proposition (1).

In this example

(i) Smith believes that (2) is true,
(ii) (2) is true, and
(iii) Smith is justified in believing that (2) is true.

Therefore, according to the classical definition of knowledge, one should claim that Smith knows that (2) is true. But it is absolutely clear that Smith does not know that (2) is a true proposition, as (2) is true merely due to the facts that Smith got the job instead of Jones and Smith also had 10 coins in his pocket, what he did not know.

Considering this example in the light of the approach set forth above, we immediately see that the proposition (2) represents Smith's *individual knowledge* acc. to Def. 2. Since Smith has discussed this knowledge with no one else, this knowledge does not represent *societative knowledge (objective one in the new meaning)* acc. to Def. 5. Since Smith has not verified the veracity and justification of the proposition (2) by his own experience regarding his freedom of action while using the proposition (2), this knowledge does not represent *adequate knowledge* acc. to Def. 6. However, if Smith had verified (2) regarding his freedom of action, he would immediately have revealed his false premises with respect to (2).

Thus, Smith's (subjective) knowledge (2) is neither societative nor adequate one. The second finding – knowledge (2) is not adequate – is most important for current example.

5.3. Alvin Goldman Problem

Let us now analyse a thought experiment suggested by Alvin Goldman.

A traveller is driving through an area, where locals built up fake barns along the road. These barns are made so masterly that it is impossible to optically distinguish them from genuine those. One of the barns is, however, indeed a genuine one.
The traveller makes a stop – fully coincidentally – just at this genuine barn. He has every reason to believe that

(3) ‚I have made a stop at a genuine barn'.

In this example

(i) The traveller believes that (3) is true,
(ii) (3) is true, and
(iii) The traveller is justified in believing that (3) is true, because all the fake barns, he drove by, are optically not distinguishable from the genuine one. Besides this, he has never seen in his life a road spread with fake barns (induction).

Hence, according to the classical definition of knowledge, one should claim that the Traveller knows that (3) is true. However, since he made a stop at the genuine barn absolutely by coincident, it is impossible to state that the Traveller really knows that (3) is true.

Let us consider this example in the light of the approach set forth above. The proposition (3) is *individual knowledge* of the Traveller acc. to Def. 2. In this example, the system-constituting concept of the system[19] {Traveller + barn}[20] is 'determining genuineness of barn', i.e. whether the Traveller can enter it or not.

For a further analysis, we have to differentiate between two cases:
1) All travellers (incl. our Traveller) do not come to barns, but look at them only from some distance away. Thus, they have only optical contact with the barns.
2) Travellers come to barns, so that they can tangibly distinguish a genuine barn from a fake one.

In the first case (exclusively optical contact with barns), this *individual knowledge* of the Traveller would not be *adequate knowledge*, as the proposition (3) would represent the result of cognition of merely optical properties and relations in the given system {Traveller + barn}, which are admittedly necessary, but not sufficient for the implementation of its system-constituting concept 'is the barn a genuine one or not', cf. Def. 6. Indeed, the genuine barn looks optically like a fake one, but not only this: it is also possible to enter the genuine barn, while a fake one is merely a picture.

This *inadequate* knowledge can even become *societative* one, if the Traveller discusses with other travellers (who, as the Traveller himself, also only see the barns, but do not enter them), what they have seen, and they come to a common conclusion that they see in front of them genuine barns, cf. Def. 5.

In the second case (a tactile contact with the barns is possible), as soon as the Traveller had verified the veracity and justification of the proposition (3) by his own tactile experience regarding his freedom of action while having used the proposition (3), i.e. he had just entered the genuine barn, in front of which he had made a stop, he came to the conclusion that his *individual knowledge* (3) is *adequate one* acc. to Def. 6. And it is really so: he did make a stop in front of the genuine barn!
The fact, that all other barns along the road are a fake, does not play any role for the current statement of question[21].

If our Traveller discussed his tactile experience (he entered the barn) with other travellers, who have 'visited' other, fake barns, he could not establish 'common reality' with them.

[19] what this system serves for
[20] the Traveller = participant, barn = surrounding
[21] is the statement ‚I made a stop at a genuine barn' an adequate one or not?

Thus, his *adequate knowledge* (3) regarding the genuine barn would not become *societative knowledge* acc. to Def. 5.

These two examples make clear that the definition of 'knowledge' in its classical analysis (chap. 5.1) is not complete.

5.4. Bertrand Russell: Othello and Co.

In treatise [2], chap. 12, Bertrand Russell considers the problem of determination what is true and what is false using the example of Othello's opinion on Desdemona's love for Cassio.

We will here analyse this example in terms of adequate / inadequate knowledge.

The system {participant + surrounding} looks in this case like {Othello + 'Desdemona's relation to Cassio' + 'Othello's relation to Iago'}. This system serves for answering the question, whether Desdemona loves Cassio, i.e. if the 'Desdemona's relation to Cassio' is love. Hence, exactly this makes the system-constituting concept of the given system:

> determination if the following proposition is true: 'Desdemona's relation to Cassio = love'.

Othello states:

> (4) 'Desdemona loves Cassio'.

This proposition (4) is the result of cognition of the set of merely those Desdemona's relations to Cassio, which are known to Othello from his relation to Iago. However, these – recognised by Othello – Desdemona's relations to Cassio are not sufficient for implementing the system-constituting concept of the system {Othello + 'Desdemona's relation to Cassio' + 'Othello's relation to Iago'}, cf. Def. 6. Therefore, this Othello's *individual (subjective) knowledge* (4) does <u>not</u> represent *adequate one*.

One could here object that Othello had also direct relationships to Desdemona and to Cassio, as well. Yes, it is true. However, since Othello ascribed merely mediocre importance to these relationships in the given system with given system-constituting concept, these direct relationships to Desdemona and to Cassio had not become the subject of his cognition, cf. Def. 1. Pure and simple, he just ignored his direct relationships to Desdemona and to Cassio.

If Othello had listened not only to Iago, but also used other available relations for the verification of the veracity and justification of the proposition (4) by his own experience regarding his freedom of action while using the proposition (4), he would have come to the conclusion that his *individual (subjective) knowledge* (4) is *inadequate one*. For example, he would have ascribed priority importance to his relationships to Desdemona and to Cassio and, in such a way, included them in the circle of his cognition, instead to have ignored them.

6. Practical Application: The Factors of Efficient Communication

[22]

1. Now, we like to apply the approach developed above to the research of factors influencing the communication efficiency between humans.
With this aim in view, we state the question: in which situation is *the area of mutual understanding* between the participants of communication (*Participant1* and *Participant2*) the biggest one?
The answer to this question sounds as follows: their *area of mutual understanding* is the biggest one if these both participants are identical to each other. Indeed, in case of their identity, the subjective knowledges of 'both' participants are equivalent to each other (Knowledge1-0 = Knowledge2-0); hence, their *area of mutual understanding* is identical to Knowledge1-0 = Knowledge2-0, see Figure 1 in chap. 3.

Let us figuratively represent the communication process between the *Participant1* and *Participant2*, which includes their communicative sub-processes of consciousness, in such a way that both participants are connected to each other by a 'communication channel' with a certain 'cross-section'. The size of this 'cross-section' represents virtually *the area of mutual understanding* of the Participants:

- if the 'cross-section of the communication channel' is equal zero, then *the area of mutual understanding* is an empty set, i.e. is lacking;
- if both participants are identical to each other, then the size of the 'cross-section of the communication channel' (in this case – to oneself) is the most possible for the given Participant(s).

Is it helpful to normalise to 1 this individual maximally possible 'cross-section of the communication channel' of a Participant to oneself? At the first glance, it is not really helpful, because this 1 is unique for each other Participant, i.e. there is no an absolute etalon for this 1.

Thus, the easiest way to gain 'mutual' understanding is with yourself. In this case, the size of the 'cross-section of the communication channel' is the maximal possible for oneself, i.e. one needs the least resources for the communication with oneself.

2. On the other side, human being strives 'to transplant' a bit of itself into **Another**. The reason for this is the existential angst[23] motivating the human being to endeavour 'to be not forgotten', 'to live on' in its posterity, in its inheritance in the widest sense of the word: in its children and in artefacts created by it.
The broader *the area of mutual understanding* with this Another is, the easier, in the sense of saving resources, it can be done. Indeed, if Another does 'understand me at a word and at a glance', then I can efficiently explain to Another my thoughts and feelings.
Thus, I could have 'transplanted' a bit of myself into Another in the most efficient way if Another had been myself! However, if Another is identical to myself, I could not achieve the object in view: 'to transplant' a bit of myself into Another.

[22] this chapter was written after having watched the movie Her (2013, Spike Jonze)
[23] see, e.g. [5] Irvin D. Yalom ‚Existential Psychotherapy', 1980

That is, in the situation, where Another is identical to myself, the broadest for me communication channel is indeed available for me, but I have no motivation at all to use this channel for the 'transplantation' of myself into myself.

Therefore, Another, in whom I strive 'to transplant' a bit of myself, **must differ** from me. This fact of the inevitable **non**-identity of myself and Another necessarily causes decreasing the throughput capacity (decreasing 'cross-section size') of the communication channel between us compared with my individual maximal throughput capacity of such a channel, when I communicate with myself. But, on the other hand, this fact increases my strive, my motivation for communication.

3. We can notice here the categorial complementarity between ‚the throughput of the communication channel between the Participants' and 'the motivation of the Participants to communicate with each other'.
Indeed, if Another radically differs from me, I get a heightened interest in him/her as in something **different** from myself. However, virtually due to this radical difference between us, *the area of mutual understanding* between us ('the cross-section size') is so small that we hardly understand each other.

Hence, an efficient communication between me and Another presumes a situation-dependent optimal *balance* between these both categories: 'the motivation of the Participants to communicate with each other' on the one hand and 'the throughput capacity of the communication channel (*the area of mutual understanding*) between them' on the other hand.

4. A communication process can only happen if it is initiated and then maintained/performed.
In order to successfully initiate this process, the initial interest in Another is necessary, i.e. my initial motivation to start the communication just with this Another. The initial interest is always caused by the **difference** of Another from me. The more obvious the difference from Another is, the less resources I spend for making decision on the try to communicate with him/her.

It has to be noticed here that the communication initiation itself can be blocked by the means of the physiological and psychological self-defence of Participants, because these means work immediately and before all other things.
The feeling of disgust (e.g., unpleasant smell, appearance and so on) represents an example of the means of physiological self-defence; an ideological attitude (e.g. aversion against other ethnic groups, other confessions etc.) can be counted to the means of psychological self-defence.

In order to sustainably maintain an already initiated communication process, **a big area of mutual understanding** (a big throughput capacity of the communication channel) between me and Another is necessary. The bigger this capacity is, the less resources I spend for a sustainable communication with him/her.

Thus, making my choice for communication with **significantly different** Another, with whom I simultaneously have **an acceptably big area of mutual understanding**, I form the

most efficient[24] communication process. This is felt by the Prticipants as 'we immediately and easily understand each other; we do not get tired of each other; communication pleasures us'.

5. What does ‚**significantly different** Another' mean and what does '**an acceptably big area of mutual understanding** with Another' depend on?

1) ‚**Significantly different** Another' – according to the definition – is recognisable for the initiation of communication with him/her; he/she shall motivate me – by his/her directly perceivable characteristics/attributes – starting communication with him/her, i.e. shall awake my interest in him/her.
Another virtually appears to us by the qualitative characteristics of how he/she communicates with his/her surrounding: how Another

- exchanges information with the outer world (perception: intuitive understanding and sensory skill),
- treats (judgement: emotionality and rationality),
- directs (reacting: active or passive) and
- prioritises (attitude: external or internal priority (authority) at decision making)

this information, see [3], chap. 4.1 (there: subsection ‚sociology').

Such a quantitative description of the character of human's communication is being given – in a better or worse approximation – by different classification systems for personality types (for example, C. G. Jung 'Psychologische Typen' (1921), E. Kretschmer 'Körperbau und Charakter' (1921, 1926), Fritz Riemann „Grundformen der Angst. Eine tiefenpsychologische Studie" (10. überarbeitete und erweiterte Auflage, 1975), A. Аугустинавичюте 'Социон, или Основы соционики. Соционика, ментология и психология личности' (1996[25])).
All these classification systems for personality types base on the detection and singularisation of one pair (as, e.g., extro- and introversion by Jung) or several pairs (as, for example, by Kretschmer and by Riemann - two pairs, by socionics - four pairs) of mutually complementary characteristics of human characters. Single personality types within these classifications are then determined by the exhaustive combination of these complementary characteristics. Some classifications also find correlations between the in such a way determined personality types and the appearance of face and body.

In the frame of such classifications of personality types, ‚**significantly different** Another' possesses – in the theoretical ideal – character traits being complementary with the traits of my character. For example, the personality type 'Huxley' (contemplative-intuitive-ethical-extroverted) – in the theoretical ideal – maximally differs from the type 'Maxim Gorky' (active-sensory-logic-introverted) according to the socionics classification.

2) What does '**an acceptably big area of mutual understanding** with Another' depend on?

The communicative sub-process (communicative sub-function) of consciousness is not only non-confined by using sense organs, but includes – in the first line – the 'existential' channel of communication (called in literature 'stream of consciousness'), i.e. a direct communication from me to Another happening simultaneously on all currently available planes: rational, emotional, etc.

[24] in the sense of the minimal resources consumption for the achievement of the result in view
[25] Augustinavichiute A. 'The Socion, or Socionics Basics. Socionics, Mentology, and Personality Psychology'

As already mentioned above, if Another is identical with me, the most broad for me communication channel, i.e. the biggest area of mutual understanding with 'Another' (in this case – with myself) is available to me. The fact of the inevitable **non**-identity of myself and Another necessarily causes decreasing the throughput capacity (decreasing 'cross-section size') of the communication channel between us compared with my individual maximal throughput capacity of such a channel, when I communicate with myself.

Thus, '**an acceptably big area of mutual understanding** with Another' depends on how efficiently (in the sense of the freedom of action) me and Another can agree on the common understanding of the subsets of our subjective knowledges Knowledge1-0 and Knowledge2-0, i.e. how me and Another – using the means available to us for the communication between each other[26] – are able to achieve mutual understanding that it is a matter of the same entities, see chap. 3.

It is impossible to describe this factor qualitatively, but a quantitative metric is necessary for its adequate description. No one of the personality types' classification systems known to me does address the description of the size of 'the area of mutual understanding'.

To this end, it is necessary to develop an approach being complementary to the known classifications of personality types and enabling the quantification of the communication intensity between Participant and its surrounding. Such an approach, as a minimum, shall establish a quantitative equivalence between the known degrees of communication intensity on the one side and the throughput capacity of the communication channel on the other side.
For example, the conventional degree of communication intensity *acommunication* (*zero-communication*) would correspond with the throughput capacity of the communication channel near zero (a similar degree of the communication intensity emerges in the real state of apathy).
The conventional degree of communication intensity *omnicommunication* (*ideal communication*) would correspond with the throughput capacity of the communication channel being theoretically maximally possible for the human being as biological species.

Then, the individual position of a Participant on such a 'scale of communication intensity' between the *acomunication* and the *omnicommunication* would represent the individual maximal throughput capacity of the communication channel for the concrete Participant, when he/she communicates with oneself. Please note that pure physiological factors like brain's organic lesions can also set an upper-limit on the throughput capability of the communication channel.

Hence, the size of *the area of mutual understanding* between me and Another can only be strictly less than the least of (mine and Another's) individual positions on the 'scale of communication intensity':

‚the area of mutual understanding' (me, Another) < min {position on the 'scale of communication intensity' (me); position on the 'scale of communication intensity' (Another)}.

[26] the concrete means used for this purpose, e.g. the communication language, play a significant role limiting or extending the area of mutual understanding

We would like to stress again that the concrete means used for communication, e.g. communication language, play a significant role and set the upper-limit for the size of *the area of mutual understanding*.

6. From what has been said above, it follows that the qualitative (personality types) and quantitative (e.g., 'the scale of communication intensity') approaches are complementary to each other in relation to how to form an efficient and effective communication between Participants.

Hereby turned out that if the communication initiation itself has not been blocked by the means of the physiological and psychological self-defence of Participants, for example, by the feeling of disgust or an ideological attitude, then **a significant difference of Participant's personality types** is merely important for the initiation of communication, for awaking the initial mutual interest in each other. Its importance is rapidly decreasing with time ('greet him according to his clothes').
In order to sustainably[27] maintain communication, **a big area of mutual understanding** between the participants of communication is necessary for enabling them to efficiently agree on the common understanding of the subsets of our subjective knowledges, to achieve mutual understanding that it is a matter of the same entities. Its importance is quickly increasing with time ('take leave according to what he knows').

[27] устойчиво (RU), nachhaltig (DE)

7. Conclusion

As we can see, the categorisation of the notion 'knowledge' introduced in the current work enables analysing different phenomena in a natural and adequate way.

We concluded that using the notion *knowledge* always requires a clarification, which category of knowledge is meant. We identified the following non-mutually-exclusive types of knowledge:

- *individual (subjective)* acc. to Def. 2,
- *societative (objective with a new meaning)* acc. to Def. 5 and
- *adequate knowledge acc. to* Def. 6 or Def. 6a.

Usage of these categories of knowledge significantly simplifies the analysis and understanding of different phenomena. We would like to particularly note the convenience of the usage of the category 'adequate knowledge'.

It appears quite plausible that the category *adequate knowledge* acc. to. Def. 6 / Def. 6a allows to dispense with using such absolute attributes like 'true' and 'false' regarding knowledge. Instead, we get the pair *adequate – inadequate knowledge* into our arsenal, and Def. 6 provides us with a clear criterion for making a decision with regard to this.

If it deals with a cognising system, i.e. which serves for finding an answer to a question, then adequate knowledge is the result of cognition of the set of its properties and relations being necessary and sufficient for answering to the question asked.
Our approach enabled to understand why it is so important to master the art of asking: an adeptly asked question is precisely that, what creates a cognising system – as its system constituting concept –, which enables getting an interesting/useful answer, i.e. enables the adequate cognition to happen.

It is noted, without going into details, that the categories of knowledge as listed above are applicable at the individual level (what we analysed in the current work) as well as at the group level. That is, a whole society can have its *societal subjective (individual) knowledge*. The 'area of mutual understanding' between different societies represents their *intersocietal societative knowledge*. *Societal individual knowledge* as well as *intersocietal societative one* can be *adequate* (or not).
Thus, the categorisation of the notion 'knowledge' introduced in this work retains its sense and applicability independent of a concrete substrate: a person/individual or a group/society. That is, this categorisation is invariant under the substrate, to which it is being applied.

In practice, the application of the developed approach to the research of the factors impacting the efficiency of communication between humans showed that the qualitative (personality types) and quantitative (e.g., 'the scale of communication intensity') approaches are complementary to each other in relation to the understanding how to form an efficient and effective communication between its participants. It turned out that the communication initiation phase and the phase of its sustainable maintenance are a complementary whole.

Hereby, a significant difference between the personality types of communication participants is merely important for the initiation of communication, and the importance of this difference is rapidly decreasing with time (‘greet him according to his clothes’). In order to sustainably maintain communication, a significant *area of mutual understanding* between the participants of communication is necessary, and its importance is quickly increasing with time (‘take leave according to what he knows’).

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9. Acknowledgements

I would like to express my great appreciation to my wife Irina, for our most valuable and interesting discussions about single aspects of the topic as well as to my daughter Elina for the recommendation of the movie Her (2013).

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