VERIFYING CONCEPTUAL SYSTEMS MODELS FOR THE INDONESIAN MICRO SATELLITE PROGRAMME AND THE TRUTH

By
Alexander Sudibyo
Edith Cowan University, Perth, West Australia
Indonesia National Institute of Aeronautic and Space (LAPAN), Jakarta, Indonesia
Email: asudibyo@student.ecu.edu.au

Abstract

Since 2002, the author has run a research project having three research questions. The first is to investigate whether a western systemic approach can be successfully used to define solutions of complex, pluralist and coercive problems in a developing eastern world country such as Indonesia. The second is to examine whether the generated solutions will be acceptable to the stakeholders. The third is to explore whether systems approach can be used to transform high values and goals of Indonesians held within the state philosophy Pancasila into realistic and acceptable actions. The case study is the micro satellite development activities, which is abbreviated as Sipesmik (Sistem Indonesia Pengembangan Satelit Mikro = Indonesia system in developing micro satellite). This paper especially relates with the second research question.

Using a combined of system thinking and action research, the author developed models. To investigate the stakeholders' acceptance of those models, it was managed a Sipesmik conceptual models verification in March- April 2003. In this event, there were comments from some respondents that recount the truth. To understand better those comments and to assess the relationship between truth and verification of models, this paper was prepared. For this, the author had taken advantages of *(1) 'The correspondence theory of truth' (2) 'The disquotationality theory of truth' (3) 'The pragmatist theory of truth' (4) 'The coherence theory of truth' and (5) 'The Tarski's semantics of truth'*.

1. INTRODUCTION

On December the 10^{th,} 1998, the President of the Republic of Indonesia promulgated the manuscript of the 'Indonesia National Concept on Space' (INCS). Since then the concept, the basic teaching and the direction of views, which are contained in the INCS has to be the concept, the basic teaching, and the direction of views of Indonesia in space. The INCS states that national space of Indonesia is developed through its seven components: *human resources, manufacture industry, service industry, natural resources, science and technology, political and legal aspects and institutional aspects.*

As a follows up action of INCS, the author is well appointed to assess on how to manage the space science and technology development in Indonesia. For this purpose the author uses a combined method of systems thinking and action research to develop conceptual models for space science and technology development, which the case study is the micro satellite development that has been pioneered by LAPAN.

The modus of study was interpretive investigation on what the stakeholders experience by participating in an action research to improve the situation using toolkits provided by systems thinking. Critical System Heuristic (Ulrich, 1987) was chosen due its powerful technique that provides possibility to get what people think about present situation ('what is') and what they think about 'what ought to be' the situation (see Appendix 1). The data of 'what is' can be input for the Rich Picture of the present situation, and the data of 'what ought to be' that represents the ideal situation can be input for the Root Definition, as requested by the Soft System Methodology (SSM) (Checkland, 1981). Aware of unfamiliarity of the chosen respondents with Systems Approach, it was thought necessary to implement an engagement process as suggested by Ledington and Ledington (2001). For this purpose the Interactive Model of Innovation Process (Manley, 2001) (see Figure 1) was thought appropriate since it presents a systemic view of technology innovation process, which also becomes the concern of the study. Up to this stage the investigation can generate conceptual models (Rich Picture, Root Definition and Task Models). This was thought enough for interpretive targets, however aware of possibility of respondents asking for implementation steps, and rationality of the identified tasks, the Viable System Model was used to map the present organization situation and provide suggestion on how to improve the project organization; and the System Dynamics (SD) (Forrester, 1990a, b) was used to describe the causality relationships among the identified tasks.

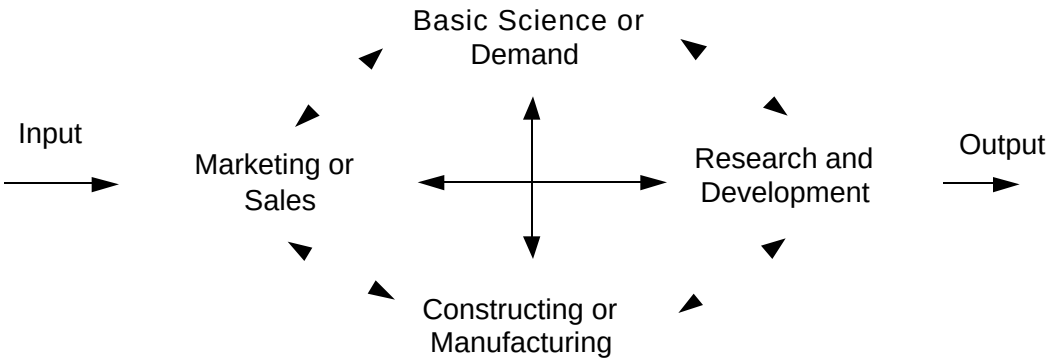

Figure 1**: INTERACTIVE MODEL OF INNOVATION PROCESS**
(Source: Manley, 2001)

The resultant models were then verified with the help of respondents based on their judgments. The models validation form comprised 7 questions (see Appendix 1). The first and second questions were designed to find out whether respondents could recognize their role in the designed system shown in the model. The third question was designed to capture whether there are views or comments made during the interviews that were not yet included in the models. The fourth and fifth questions were designed to get the respondents judgment on how well the models transformed:

(fourth) the high level goals: space for prosperity and security with a focus on sustainable food and community involvement into comprehensive actions,

(fifth) the Pancasila, the state philosophy of Indonesia (Department of Information, 1996, Sukarno, 1945) values and goals into comprehensive actions, in term of its accordance, consistency and coherence.

The sixth question was designed to get the respondents' judgment on how well the viability of the model in terms of its effectiveness, efficiency, efficacy, equity, ethicality and elegancy, using the formulas suggested (by the respondents) during the interview. The seventh question invited respondents give further comments. A statistic method was designed to process the validation data from which results can be generated on how well the models were judged by the respondents.

This paper focuses on five comments given by the respondents with regard to the seventh question that relates the Sipesmik modeling with truth. Those comments are as follows:

(1) The truth is not easy to do and even resource consuming, but surely it will achieve the expected result with less (might be no) conflictive actions …….

(2) The truth is not easy and eventually resource consuming. This is one of the risks that should be faced when searching the truth. I remember the first interview, when you asked me about 'what ought to be', I understand that you need to know the 'truth'. Congratulation, you get it.

(3) As you wished, you get what you want: 'the truth' which is derived from 'what ought to be'. The truth is hard to get, but it does not always serve you in practice, even in certain cases, you might get difficulties to use it. ……I am sure this is not an easy task. Congratulation you did it.

(4) What you can get by asking 'what ought to be' is a truth but not the truth. The truth is only Thy truth. What you get now is a relative-truth therefore bewares of the coming disagreement of people. It was not a truth since everyone said so, but it is a truth since everyone says so, therefore do not stop from truth searching if you would like to be up to date.

(5) It is true. When you develop satellite for sustainable food, you have not to limit your self on building and operating satellites, you have to include in your program, how sustainable food could be achieved by the help of satellite technology.

The five comments above hold three basic remarks that relate to:

(a) The notion of truth.
(b) The use of '*what ought to be'* questions and the search for truth.
(c) The agreement between '*develop satellite for sustainable food'* and *'building and operating satellites that have the approved capability for achieving and maintaining the sustainable food.*

To understand better of those remarks, five truth-theories have been assessed, and have been used to investigate the relationship between systems models verification and the truth.

2. CORRESPONDENCE THEORY OF TRUTH

When answering the question of '**what is truth'** there are writers with difference answers, such as 'truth' means **quality or state of being true** (Hornby, 1974), 'truth' is the **relation-to-reality pattern** (David, 1994), and 'truth' is the **correspondence** between the **representation** and **what it represents** (Lloyd, 1996). All of these answers concerns with the correspondence theory of truth. Among these answers the author has the interest most with the latter, especially with Lloyd (1996) further description on the word '*true*' that denotes the **validity** of an **intended or expected correspondence** between **a representation** and **what it represents**.

The above answers brought the author into a reflection that the correspondence theory of truth concerns with four items:

a. '**A representative'** is something that represents another, such as a model, a map, a diagram, a sample and an ambassador
b. '**Fact**', '**reality**' is something represented by another such as:
    a. a **car** represented by a **car model**,
    b. a **city** represented by a **city map**,
    c. a **process** represented by a **flow diagram of process**,
    d. a **population** represented by a **sample**, and
    e. a **country** represented by an **ambassador**.
c. **Method** of **'**representation**',** 'relation', 'correspondence' or 'transformation' such as:
    a. **reducing** size and functions of a real car into its model
    b. **transforming/ mapping** a city into a city map
    c. **simplifying** a process into a flow diagram of process
    d. **deducting** characteristic of a population from samples
    e. **delegating,** a president gives power or authority on behalf of the country to a person to represent the state (ambassador)
d. '**Validity'** of the 'representation', 'relation', 'correspondence' or transformation, such as**:**
    a. **proof** of the performance of the car model to the real car
    b. **ground truth** of a map to the city
    c. **verification** of a flow diagram to the real process
    d. **sampling validation** to proof whether the method applied to select samples results samples that are valid to represent population
    e. **power letter** showing delegation of authority from a president to an ambassador

The above reflection shows that the validity or degree of correspondence of a model with its reality depends on the method used to transform the characteristics of the reality into a model. When the transformation reduces (corrupts) the characteristic of the reality then the characteristics held by the model are less then those of the reality. For example due to the size and function are reduced, the performance of a car model is less than the real car. But it gives other benefits such as that the car model is easily brought, it can be put into your bag, and you can easily show it up to your friends that your favorite car is that is represented by the model. This implies that in 'modeling of a reality' there must be an **objective (s)**, thus loosing something, but substituted by gaining other things. These gains should be of significance, so that the modeling

effort is worthwhile. Due to specific objective, modeling can focus on or amplify certain characteristics of the reality, so that people can easily recognize 'what' or 'who' is represented by the model. This type of transformation or modeling is commonly practiced by caricaturists where in certain cases people recognize easier a public figure through a caricature then a photographic picture.

The above reflection teaches the author that the correspondence theory of truth helps explain some of the respondents' comments. The **Sipesmik conceptual models** are the **representation** and **they** represent **the idealism of the respondents (the world)** on how to develop micro-satellites for sustainable food. The question of '*what ought to be'* develop micro satellite for sustainable food, was answered by most of the respondents that '*it must include building and operating micro-satellites and achieving sustainable food with the help of micro-satellite technology'*. Therefore there is no doubt that '*building and operating micro-satellites and achieving sustainable food with the help of micro satellite technology*' correspondence or agrees with '*develop micro satellite for sustainable food'*. The question of '*what ought to be'* is a request to the respondents on their idealism. This idealism becomes the '*reality*' and '*the combined system thinking and action research* (*Sipesmik modelling)'* is the '*mapping*' that transforms the idealism into operational actions. The map is the Sipesmik conceptual models that contain the operational actions. **The correspondence between** the '*idealism of the respondents in developing micro satellite for sustainable food*' **and** the '*Sipesmik conceptual models'* is **the truth** of Sipesmik. This means that the Sipesmik conceptual models **are true** when they represent **the reality.** Therefore**, to investigate** whether '*Sipesmik conceptual models'* **correspondence** with the '*idealism of the respondents in developing micro satellite for sustainable food*', a **Sipesmik conceptual models verification** was carried out in March – April 2003.

Regarding objective of the Sipesmik modeling, it can be seen from a number of angels, but actually the most attractive is fulfilling the need of a tool to market the idea of creating and maintaining sustainable food with the help of space technology application and community involvement. A number of models were developed due to the need to amplify certain characteristic. The Root Definition is to show the general view of the system. The Viable System Model is to show how to organize the system. The System Dynamic Model is to show the rationality relationship between components of the system.

To end this section the author presents here a quotation the Lloyd (1996) answer on the question of precisely what does the correspondence consist of. He says that it consists in a complicated mapping function that comprises the conventions that govern our use of language. Further he explains that in general, if p is the proposition expressed by a sentence **lp,** then: *p is true, **just in case** the state of affairs **f(lp)** obtains in reality*. Then, as an acknowledgment to reality, **the function f is extremely complicated**, which integrate a lot of facts about the language, human culture, and about the world.

From this quotation the author learns that it is impossible to transform all characteristics held by reality into models. Since reality in infinite and a model is finite. Therefore in modelling, one should select the strongest character that becomes the main concern of the model. This assessment also provides warning when

executing a models-verification/ validation, one has to be aware of facts or reality that are not yet included in the models. Also, that there might be statements from interviewee that the models were not perfect.

3. DISQUOTATIONALITY THEORY OF TRUTH

Disquotationalism is a radically deflationary theory of truth for sentences (David, 1994, p.52). It will deflate the correspondence theory of truth. Therefore, to show up the theoretical positions of disquotationality theorists, the author contrasts their positions then derive the necessary knowledge or experience, in support to this assessment.

The following is a passage, quoted from Quine (1987, p 213), a deflationist whose views about sentence–truth was expressed to deflate the correspondence theory of truth.

> *"What on the part of true sentence is meant to correspond to what on the part of reality? If we seek a correspondence word by word, we find ourselves eking reality out with a complement of abstract objects fabricated for the sake of the correspondence. Or perhaps we settle for a correspondence of whole sentences with facts: a sentence is true if it reports a fact. But here again we have fabricated substance for an empty doctrine. The world is full of things, variously related, but what, in addition to all that, are facts? They are projected from true sentences for the sake of correspondence.*
>
> *But let us ponder this last maneuver for a moment. The truth of 'Snow is white' is due, we are told, to the facts that snow is white. The true sentence 'Snow is white' corresponds to the fact that snow is white. Now we have worked the fact, factitious fiction that it is, into a corner where we can deal it the coup de grace. The combination 'it is a fact that' is vacuous and can be dropped; 'It is a fact that snow is white' reduces to 'Snow is white'. Our account of truth in terms of facts has now come down to this: 'Snow is white' is true if and only if snow is white."*

Observing the above quotation, the author agrees with David (1994, p.53) who writes that: "……*the deflationary suggested by Quine is the view that the right theory of truth for sentences equals the correspondence theory minus entities like states of affairs, propositions and facts, and minus semantics relations like representation, expression, and correspondence"*. Therefore from this section the author focuses only on truth-sentence.

If the right theory of truth for sentences equals the correspondence theory minus entities and minus semantic relations, then what is the rest? Nil, then how this is compared to Aquinas proof of truth: *The existence of truth is self evident. For whoever denies the existence of truth grants that truth does not exist; and, if truth does not exist, then the proposition Truth does not exist is true: and if there is anything that is true, there must be truth (The Aquina's proof in Summa Theologieae; see David, 1994, p.60).*

This leads to an understanding that this theory contradictorily confirms that correspondence theory of truth for sentence regards entities and their semantic

relations. This is in a line with Lloyd (1996) who writes that the correspondence theorists agree that truth is disquotational, and is not a feature of truth, but a feature of the use of language, since it is a convention of the use of language that if a proposition is true then it is justified in asserting it. From this statement the author learns that the act of asserting a proposition as assertible just in case there is a proof that it is true. But Lloyd (1996) also provides further statement that there are many other ways in which the simple act of making an assertion implicitly asserts something about the proposition that is being asserted.

Implied from the above quotation the author tries to show up a bi-conditional situation in a question "Is there any disquotationality of truth for Sipesmik objective?" To answer this, the author invites the original stakeholders take opportunity to do so. Anyhow, post modernism rejects any single truth and sees it as being entirely dependent on the viewpoint from which truth is seen (Vardy, 1999). From the management science point of view, there are two types of objective: the 'stated objective' and the 'real objective'. Stated objective is the objective informed to public, while real objective is the objective that is really would like to be achieved with the project. Normally, the stated objective is launched to get political or public support, while real objective is used to guide the organization of the project. In the case of Sipesmik '*develop micro-satellites for sustainable food'* is the stated objective. Is there any other objective? Up to this paper was written, the author has no proof of differentiating the stated and the real objective. Therefore, there is no disquotationality of truth for Sipesmik objective to be worried about. This could be seen as an indication of a good-governance practice, since it has no differences between stated objective and real objective.

Lloyd (1996) also writes that notwithstanding the strong view that the correspondence theory of truth is a superior theory of truth, some people may deny its validity and some criticisms might focus on the epistemological predicament that is concerned in knowing whether or not a proposition does indeed correspond or agree with the facts. This statement gives further stressing that **a 'proposition' needs proof.**

In the case of the truthfulness of '*develop satellite for sustainable food'*. People may not sure as to whether it is a real meaning or just a trick to gain political support. People may also not sure as to whether this was said, with in depth thought about the meaning of '*develop satellite for sustainable food'*. For, they clearly do classify propositions as true or false in everyday life, yet they cannot securely do so on the basis of their correspondence to reality. If they cannot know with absolute certainty that '*develop satellite for sustainable food is intended or expected that it shall include both the building and operating satellites and the achieving sustainable food with the help of satellite technology'*, then that simply means that they cannot know with certainty whether the proposition *"develop satellite for sustainable food*" is true.

4. THE PRAGMATISM THEORY OF TRUTH

The pragmatic theory of truth was first enunciated by Charles Peirce in 1878 (James, 1967) who introduced pragmatism into philosophy. According to him, the term is derived from the same Greek word π_&___, meaning action, from which the words 'practice' and 'practical' come from. Then, it became famous especially from the

work of William James (Lloyd, 1996).

The followings are several quotation from the work of William James (1967, p214-215)

(1) *"…..an idea is 'true' so long as to believe it is profitable to our lives". ……..*

(2) *"…truth is 'one species of good', and not, as usually supposed, a category distinct from good, and co-ordinate with it. The true is the name of what ever proves itself to be good in the way of belief, and good, too, for definite, assignable reasons".*

(3) *"….. it would be **better for us** to believe in that idea, **unless**, indeed, **belief in it** incidentally **clashed** with other greater **vital benefits**."*

Observing the first and second quotations above, the author has the same opinion as Lloyd (1996) who writes that it is completely understandable to any rational person that a proposition is true or false autonomously of the utility of our belief in it. Does it mean that pragmatist irrational? For this, the author invites the reader to judge. The third quotation shows that **pragmatists do not have any 'fixed truth'**, what they have just '**temporary truth'**. If this philosophical stance applied in real world, there are possibilities to cause conflictive troubles. To further empathize this, the author borrowed an example given by Lloyd (1996). Say that based on a space observation classified report, our planet earth was about to be destroyed by a smash of a gigantic meteor. If this report informed in public, this might cause people so much misery and stress to know the world was about to end, so that, it would be better not to tell anyone. Based on this reasoning, then a cruel pragmatist would say that it was simply not '*true*' that the world was about to end.

Assessing this theory in this way, the author does not have the intention to recount with respondent's comment number (4), but directing to focus **that all of the above examples show the important of giving a completely new meaning to the word "true" for the pragmatists**. In support to this evaluation the author recalls what F.H. Bradley (in Lloyd, 1996, p5) said of pragmatism: "*interpret it one way, and pragmatism is a set of commonplaces; in another, it is absurd*".

Then what does the author learn from this assessment? He really does not wish to deny that the value of a man's work may be increased by its implications for the research of other and for practice. But yet, he believes that it is unfavourable to the progress of science to measure the importance of any research, findings, or ideas mainly in terms of its usefulness and applicability. People can learn from the history that many important research results, ideas and discoveries have to wait centuries before they were applied in any field. This facts support to the thought that there might be important factors that cannot be disregarded in determining the value of a scientific work.

The author agrees with Tarski (2003) that there are special domains of very profound and strong human needs related to scientific research, which are similar in many ways to aesthetic and perhaps religious needs. Besides that such satisfaction of these needs should also be considered important task of research. Therefore, the question of the **value of any research cannot be adequately answered without taking into account the intellectual satisfaction which the results of that research bring to those who understand it and care for it**. Recognizing the respondent comment

number (1) the author invites the readers to think that a research result such as the Sipesmik conceptual models which gives a better understanding of the world (*the respondents' idealism)* and makes it more harmonious in people eyes (*the generated solutions accepted by the stakeholders' representative: the respondents*) should be held in lower esteem than, say, an invention of practical benefits which reduces the cost of microchip production, or improves a welding technique, should be thought as unjust.

5. THE COHERENCE THEORY OF TRUTH

A coherence theory of truth states that the truth of any (true) proposition consists in its coherence with some specified set of propositions (Joung, 2001). The primary competitor of this theory is the correspondence theory of truth. There are two basic differences between them. The first is that both of them give conflicting accounts of the **relation between propositions and their truth conditions**. The first says the relation is coherence, and the second says it is correspondence. Both of them give conflicting **accounts of truth conditions**. The coherence theorists say that the truth conditions of propositions consist in other propositions. The correspondence theorists tell the contrast that the truth conditions of propositions are not (in general) propositions, but rather objective features of the world. Even though, the correspondence theorists are at the view that propositions about propositions have propositions as their truth conditions (see section 3).

Based on the above short observation the author will focus the philosophical stance of coherence theorists as quoted in first paragraph of this section saying in other form that a proposition's truth consists in its fitting into a coherent system of propositions. This proposition seems to be irrelevant, when viewed as a theory of 'mathematical-truth'. Example, if one claims that a proposition about imaginary numbers (such as *p x where p = -1*) is true by virtue of its corresponding to reality, then one might get difficulties to identify which reality it corresponds to. And then, one might be attracted to say that this equation's truth consists in its coherent relationship with the axioms and definitions of the arithmetic of complex numbers.

In the above example the author agrees with Lloyd (1996). Therefore, in the Sipesmik context, the author is sure that he can not refer to 'mathematical reality' without incurring any metaphysical or epistemological liabilities! Of course, he can meaningfully and usefully talk of mathematical reality without committing himself to any particular view of the nature of mathematical reality, since mathematical objects are merely fictions. Anyhow, he could still define the truth of a mathematical proposition as its correspondence to reality, with an annotation that that reality is a fictional one. In this regard, Lloyd (1996) provides a good analogy with literary criticism. The truth of a proposition about Sherlock Holmes would consist in its correspondence with a fictional reality defined by the novels of Sir Arthur Conan Doyle. Unfortunately, the coherence theory of truth would, in these cases, come to the same format of true propositions as the correspondence theory. This shows an example of conflictive point between coherence and correspondence theory of truth in relation between propositions and their truth conditions (see first paragraph of this section).

Then, what does the author get from this assessment? This assessment provides reason why there were so many respondents have come to a conclusion that Sipesmik has both high coherency and correspondency to Pancasila. It seems that because both of those theories could come into the same result. The following, the author compares those two different perspectives:

From the correspondence theorists' perspective:

(a) "Respondents' idealism about how to achieve sustainable food with the help of space technology" is **the state of affairs**, 'a combination of system thinking and action research' is **the mapping** and 'the Sipesmik conceptual models' is **the map**.
(b) Sipesmik conceptual models were judge as having 'high correspondency' to Pancasila. Then the question is: "Does 'the state of affair' could be judged as having high correspondency with Pancasila?"

From the coherence theorists' perspective:

(a) 'A combination of system thinking and action research' consistently transforms the "Respondents' idealism about how to achieve sustainable food with the help of space technology" into 'Sipesmik conceptual models'.
(b) Sipesmik conceptual models were judge as having 'high coherency' to Pancasila. Then the question is: "Does the respondent idealism could be judged as having high coherency with Pancasila?"

At this point, the author invites the readers to give the answer of those two questions, but for him it becomes a new project, since it is still arguable the validity of 'mathematical truth' in this context (see second paragraph of this section).

However from coherence theory of truth, can be derived an understanding that a 'spare part' (original part) is a true part if it is coherence with some specified set of parts (see first sentence of this section). Also an imitative part can be a true part if it is coherence with some specified set of parts. 'Coherence' is an adjective of 'cohere' that comes from Latin, which means 'respond' to what is requested. To be coherent, a part should correctly respond everything requested by those specified parts. This reflection shows that coherence truth is functional truth. It is true part if it functions well.

6. TARSKI'S SEMANTICS THEORY OF TRUTH

Semantics is a branch of linguistics that concerns with studying the meaning of words and sentences (Hornby, 1974). Tarski's theory of truth also relates to the meaning of truth as a word and as a part of a sentence or sentences. Tarski (2003) formulates his semantics theory of truth, with defining the notion of truth. For this, he needs a definition which is *materially adequate* and *formally correct*. Therefore he describes the formal structure of the language in which the definition will be given to the word truth.

To help diminish any possible ambiguity Tarski (2003) catches hold of the actual meaning of an old notion of truth by recalling the *classical Aristotelian conception of truth* -- intuitions which find their expression in the well-known words of Aristotle's *Metaphysics*: *To say of what is that it is not, or of what is not that it is, is false, while to say of what is that it is, or of what is not that it is not, is true.* Then, to adapt

modern philosophical terminology, he expresses this conception by means of the familiar formula (correspondence theory of truth): *The truth of a sentence consists in its agreement with (or correspondence to) reality*. As an alternate in extending the popular usage of the term "*designate*" he applies it not only to names, but also to sentences. Furthermore, he speaks of the designata of sentences as "states of affairs," and uses for the same purpose the following phrase: *A sentence is true if it designates an existing state of affairs.*

However, he finds that all these formulations can lead to various misunderstandings, for none of them is sufficiently precise and clear (though this applies much less to the original Aristotelian formulation than to either of the others). At any rate, none of them can be considered a satisfactory definition of truth. He then concludes that it is up to him to look for a more precise expression of his intuition.

For this purpose he then employs the classical conception of truth and the medieval logical-terminology to get a criterion for the material adequacy of the definition. He uses a classical example: *snow is white* ***is true if and only if*** *snow is white*. On the 'left wing' **snow is white** is in *suppositio formalis*, and on the 'right wing' **snow is white** is in *suppositio materialis*. When in suppositio formalis snow is white is the name, while in suppositio materialis snow is white is the material, therefore he resumes that: the ***name*** is true if the ***material*** is true. This supports of what definition he needs, which is *materially adequate* and *formally correct*.

He then names an arbitrary sentence in suppositio formalis as 'X' and the same sentence in suppositio materialis as 'p'. Using the same classical conception of truth he comes to acknowledge the equivalency of 'X' and 'p' and this equivalence holds form *(T)* that *X is true if, and only if, p;* therefore he concludes that any such equivalence is an "equivalence of the form (T)". This supports him to be able to put into a precise form the conditions under which he will consider the usage and the definition of the term "*true*" as adequate from the material point of view; and he wishes to use the term "*true*" in such a way that all equivalences of the form (T) can be asserted, and *he will call a definition of truth "adequate" if all these equivalences follow from it.*

For the conception of truth that has been discussed above, Tarski (2003) proposes the name of '*the semantics conception of truth'*. He writes that semantics is a discipline that deals with certain relations between expressions of a language and the objects (or "states of affairs") "referred to" by those expressions. Using this notion, he gives typical examples of semantic concepts of *designation*, *satisfaction*, and *definition* as these occur in the following examples:

(1) The expression "the father of his country" *designates (denotes)* George Washington
(2) Snow *satisfies* the sentential function (the condition) of cold and pure
(3) The equation "2.x = 1" *defines* (uniquely determines) the number 1/2.

While the words "*designates*," "*satisfies*," and "*defines*" express relations (between certain expressions and the objects "referred to" by these expressions), the word "*true*" is of a different logical nature: it expresses a property (or denotes a class) of certain expressions, namely of sentences. However, it is easily seen that all the formulations which aimed to explain the meaning of this word referred not only to

sentences themselves, but also to objects "talked about" by these sentences, or possibly to "states of affairs" described by them.

Then the author invites the readers to observe the last comment of the respondents (see section 1) and implement the Tarski's semantics conception of truth. He asks to converse '*develop satellites'* into 'X', '*satellites for sustainable food'* into 'Y'; '*building and operating satellites'* into 'p' and *'achieving sustainable food with the help of satellite technology*' into 'q'. Then he asks to formulate the test question:" Is there any logical relationship between 'X' and 'p' and between 'Y' and 'q'?" **If we think there are equivalences, then the comment is valid.** The author also suggests use other test: "*Does either 'p' satisfy/denotes/defines 'X' or 'q' satisfy/denotes/defines 'Y'?*" **If we think, the answer is yes then the comment is valid.** In this case among the three options, the author suggests that the most appropriate seems to be 'satisfy', and then the test question become: "*Does either 'p' satisfy 'X' or 'q' satisfy 'Y'"*.

Further the author asks the reader to operate this formula into practice: "**Does either** '*building and operating satellite'* **satisfy** '*develop satellites'* **or** '*achieving sustainable food with the help of satellite technology*' **satisfy** '*satellite for sustainable food'?"*. According to the quoted comment of the respondent, the answer of the question is yes, ('**It is true'**), therefore the notion of '*building and operating satellites'* satisfy the notion of '*develop satellites'* and the notion of '*achieving sustainable food with the help of satellite technology*' satisfy the notion of '*satellite for sustainable food'*.

7. CONCLUSION

From the above assessment, the author concludes that one cannot define an acceptable definition of 'truth' without the basic concept supporting such a definition and on what condition such a definition should be applied. Therefore it is not acceptable to the author, defining truth without describing the formal structure of the language in which the definition will be given to the word truth, also the adequacy of the material and the correctness process of expressing the sentence should be considered (please consult Appendix 3).

In the case of Sipesmik context, where respondents' idealism is functioned as the reality (of the world views), the combined systems thinking and action research as the transformation tools (mapping), and the Sipesmik conceptual models as the representation, the correspondence theory of truth is the best theory to implement in understanding the circumstances. However, this does not mean that the Semantics theory of truth and others do not give important support to understand better the respondents comment on the Sipesmik conceptual models. **Some learning benefits of these assessments are presented in Appendix 3.**

While the relationship between the systems models verification and the truth is well shown also by the correspondence theory of truth. The correspondence **between** the '*idealism of the respondents in developing micro satellite for sustainable food*' **and** the '*Sipesmik conceptual models'* is **the truth** of Sipesmik. This means that the Sipesmik conceptual models **are true** when they represent **the reality.** To investigate this, **Sipesmik conceptual models verification** was carried out.

This assessment gives the author opportunity to do reflection on what should be searched in doing research. He agrees to the opinion stating that to **get something** that has implications **for the research of other** and **for practice**. The fact tells him that it is unfavourable to the progress of science **to measure** the importance of any research **mainly in terms** of its **usefulness and applicability**. From Sipesmik research he learns that there are important factors that cannot be disregarded in determining the value of a scientific work. Those are special domains of very profound and strong human needs related to scientific research, which are similar in many ways to aesthetic and also to religious needs. Therefore he agrees that this should also be considered important task of research. As a resume he agrees that the answer to the question of what does the researcher tries to get in doing research is as follows: **(1)** to get better understanding of the world, **(2)** to make it more harmonious in the people eyes **(3)** to make great impacts to other research works and **(4)** to get practical benefit. It will be excellent to get all of them, but its already fantastic to get some of them

References

Beer S (1984) 'The Viable System Model: its provenance, development, methodology and pathology', reprinted in: *The Viable System Model*, (1989) eds. Espejo R, Harnden R, John Wiley & Sons, Chichester

Checkland P.B, Scholes J (1990a) '*Soft Systems Methodology in Action'*, Wiley, Chichester

Checkland P.B, Scholes J (1990b) 'Techniques in soft systems practice part 4: Conceptual model building revisited', *Journal of Applied Systems Analysis*, vol 17

DEPANRI (1998) '*Laporan Kongres Nasional Kedirgantaraan Indonesia'* eds. Alfred Sitindjak dkk

Department of Information (1996), available at URL, captured in 17th July, 2002, 17.00 http://www.dfa-deplu.go.id/background/ republic/republic.htm,

Forrester J W (1994a) 'System dynamics, systems thinking, and soft OR', *System Dynamics Review*, vol 10, nos 2-3

Forrester J W (1994b) 'Policies, Decisions, and Information sources for modeling', in: *Modeling for Learning Organizations*, eds. Morecroft J D W, Sterman J D Productivity Press, Portland

Ledington, PWJ and Ledington, J (2001) Interpretive Inquiry: From Comparison to Engagement in SSM' in the proceeding of 'System in Management 7th Annual ANZSYS Conference 2001', eds. Dr.William Hutchinson and Dr. Matthew Warren

Lloyd, P (1996) '*What is Truth'* available at URL, captured 5/01/03, at 17.10 http://easyweb.easynet.co.uk/~ursa/philos/cert04.htm

Manley, K (2001) *Systems Thinking and Industry Innovation* in the *Proceedings of System in Management 7th Annual ANZSYS Conference 2001*, ed. W. Hutchinson, M.Warren.

Sukarno (1947) '*Lahirnya Pancasila'* Penerbit Guntur Jogyakarta

Tarski (2003) '*The Semantic Conception of Truth'* available at URL, captured 5/01/03 at 17.00, http://www.ditext.com/tarski/tarski1.html and http://www.ditext.com/tarski/tarski2.html

Ulrich W (1987) 'Critical Heuristics of Social Systems Design', reprinted in: *Critical Systems Thinking-Directed Readings* (1991), eds. Flood R L, Jackson M C Wiley, Chichester
Vardy, P (1999) '*What is Truth'* UNSW Press Ltd, Sydney, Australia
William, James (1967) '*Selected paper of philosophy'*, Everyman's Library, Dutton: New York

Appendix 1

LIST OF QUESTIONS FOR INVESTIGATING THE SIPESMIK

(Sistem **I**ndonesia **Pe**ngembangan **S**atelit **Mik**ro = **the Indonesia system for developing micro satellite)**

Question 1.

What is your underlying **philosophical stance** for investigating the Sipesmik, for example:

a. Cost benefit analysis is capable to show the economic value of an action program, therefore each action program of Sipesmik shall accomplish an economically acceptable cost benefit ratio.
b. Although Sipesmik is a research activity that should be managed as a non profit entity, but it should be also seen as a way of developing national prosperity and security.
c. Cooperative way of managing Sipesmik could guarantee the practice of open management and the use of micro satellite system, which is limited for peaceful purposes especially for preserving the nature.
d. Why develop our own satellite, global space market provide choices so that we can choose based on our own criteria that include especially preserving our nature through minimum release of manmade debris in space.

Question 2

a. Who is / ought to be :
  i) The **beneficiaries** of the Sipesmik process?
  ii) The **decision makers** in the Sipesmik process?
  iii) The **planner** in the Sipesmik process?
  iv) The **experts** used in the Sipesmik process?
  v) The **representative of those affected** by Sipesmik?

b. What **conditions are/ are not controlled** by the decision maker?
c. What **are/ought to be the constraints** on the decision maker?
d. Who has the **power to ensure success** of Sipesmik?
e. Are **those affected by Sipesmik allowed to take their fate** into their own hands despite the experts? Should they be allowed to?

Question 3

Based on your (life) experience, would you mind telling me what criteria / formula do you use to measure **efficiency, effectiveness, efficacy** (ease of use and implementation)**, equity, ethicality** and **elegancy** of a Sipesmik plan?

Appendix 2

LIST OF QUESTIONS FOR SIPESMIK CONCEPTUAL MODELS VERIFICATION

After having examined the Sipesmik (Sistem Indonesia Pengembangan Satelit Mikro = Indonesia System in Developing Micro Satellite) conceptual models, could you like please answer the following questions? This is needed to verify the models that have been created.

1. In **Figure 1**, where do you might position yourselves in the Sipesmik model?
   owner ☐ executor, ☐ or client. ☐
   You may choose more than one.

2. In **Figure 3**, what kind of tasks might your participation focus on?
   a. Science & technology innovation development …… ☐
   b. Increase/ maintain Local Government participation…….. ☐
   c. Increase/ maintain economic productivity ……. ☐
   d. Change institutional practice ……. ☐
   e. Change socio-cultural practice …….. ☐
   f. Increase/ maintain regulating the Sipesmik ……... ☐
   g. Increase / maintain managing the natural environment …. ☐

   You may choose more than one.

3. Do you think the Sipesmik conceptual models have included your views given during the interview?
   High ☐ Medium ☐ Low ☐

4. How do you consider the Sipesmik conceptual models in transforming '*the high level goals of the Sipesmik:* ***Space for security and prosperity, with focus on sustainable food and community involvement***' into comprehensive actions:
   High ☐ Medium ☐ Low ☐

5. How well do you think Sipesmik conceptual models transform the **Pancasila values** into comprehensive actions, in terms of their:
   a. Correspondence
   High ☐ Medium ☐ Low ☐
   b. Consistency
   High ☐ Medium ☐ Low ☐
   c. Coherency
   High ☐ Medium ☐ Low ☐

Note: **Correspondence** relates to the agreement or similarity of the idea

Consistency relates to 'harmony', logic relations' or agreement of each of the elements of the models with the basic idea
Coherency relates to the wholeness consistency of the models with the basic idea

6. How do you regard the Sipesmik conceptual models in terms of their:

a.	**Effectiveness**	High	☐	Medium	☐	Low	☐
b.	**Efficiency**	High	☐	Medium	☐	Low	☐
c.	**Efficacy**	High	☐	Medium	☐	Low	☐
d.	**Equity**	High	☐	Medium	☐	Low	☐
e.	**Ethicality**	High	☐	Medium	☐	Low	☐
f.	**Elegancy**	High	☐	Medium	☐	Low	☐

Note: **Effectiveness** relates to objective achievement,
Efficiency relates to the use of resources in achieving their objectives,
Efficacy relates to easiness use,
Equity relates to equal treatment to parts or parties involved and effected,
Ethicality relates to degree of morality in the models,
Elegancy relates to aesthetics or public effect of the models.

7. Could you please give any further general comments on the on the Sipesmik Conceptual Models?

MANY THANKS FOR YOUR ASSISTANCE

Appendix 3:
Some Learning Benefits Derived From the Paper

Theory assessed	For Modelling	For Truth Theory	For Sipesmik
Section 2 Correspondence theory of truth	Reality is *infinite* while a model is *finite,* which means every model is less perfect than the reality so that in the modelling of a reality people should specify **objective** or **purpose** based on which the generated model is emphasized.	It describes 'partial truth' of a reality. Therefore it will be most beneficial if the selected part is the **basic idea** of the reality, since it can represent the **whole feature** of reality.	Correspondence investigation of Sipesmik should be focused on **the basic idea, to grasp the most holistic feature of the reality.**
Section 3 Disquotationality Theory of Truth	**Dialectics enriches views and more critical** in investigating reality to be modelled. This help better select objective of modelling	It contradicts with correspondence theory of truth unless they regard the basic idea of a reality in truth sentence.	It supports the **important of investigating the basic idea of a reality** to grasp the most holistic feature of a reality
Section 4 Pragmatism theory of truth	It places the importance of usability or applicability of a model.	There is a need to reformulate the pragmatist's definition of truth	Sipesmik was designed to attract actions. Therefore there is a need of evaluating the desirability and usability of the models.
Section 5 The coherence theory of truth.	To be coherent with a reality, a model should present the functions of that reality.	If correspondence relates to partial truth then coherence relates to functional truth.	To be **correspondence** and **coherence** with reality, the basic idea of the reality should be consistently structured in the model and the parts as individual and as group that composes the structure should functionally be in agreement with the basic idea.
Section 6 Tarski's Semantics Theory of Truth	**Sentence is a model**. In modelling: '**materially adequate**' can be conversed into '**structurally adequate** in representing the basic idea'; '**formally correct**' can be conversed into '**functionally correct** in representing the basic idea'	To be true a sentence must **not only** be materially adequate and formally correct, **but also the process should be adequate.** This becomes evident in oral. A person under stress, although says a sentence of materially correct and formally adequate, but its truth is not guaranteed.	**To best represent the reality Sipesmik should be in agreement with the basic idea of reality, structurally adequate to represent it and each part as individual or group that compose the structure should functionally in accord with it and the process of investigation should be free from stress.**