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The Philosophy of System Development Methodology

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Standard systems analysis (e. g. Yourdon and Constantine, 1972) is based on the systems approach, the scientific method, and the structured view of communication. The systems approach was developed by von Bertalanffy (1962) and Wiener (1961). A system is made up of parts and, because of the complexity, the whole is more than the sum of the parts (cybernetics). Understanding the system and solving system problems requires breaking the system into parts and iteration of the analysis.

The scientific method requires defining the issues carefully and comparing theoretical hypotheses with real world tests. A theory or explanation must be followed by an experiment. Replicability of an experiment is the basic standard for truth. If a result can be replicated by other workers than the result is true. The scientific method divides problems into theories and tests of theories (Holton, 1975).

The structured view of communication views that communication is based on a set of rules and meanings that are fixed. We can communicate and accomplish goals in communications because we know these rules and meanings. It is important to emphasize that these meanings are part of this structure and they are fixed and this structure has a separate existence, in our mind (Peirce, 1958).

In this article I would like to compare various communication theories and methods to show the range of assumptions one can use to develop a systems development methodology.

SEMIOTICS OR THE STRUCTURED VIEW

Meaning in communication is based on a recursive relationship between language concepts that can be plotted. This is definitely a structural theory.

The meanings in communication are explained by the relationship between symbols and referents (Ogden and Richards, 1923). A referent can become a symbol and a symbol can become a referent (Eco, 1976). In other words the triangles for symbols and referents overlap to create meaning. This is Semiotics.

The methodology of structured systems analysis and design processes do assume this structured characteristic of communication and of systems. It is obvious, from the attitude and actions of systems analyst about the requirements, that the structure of the created design has a definite reality; and that reality takes precedence over the complaints of users of the system once those requirements have been defined by the analysts.

THE SCIENTIFIC METHOD

In the scientific method you develop a hypothesis on the basis of some theory. Then you design some kind of experiment to prove or disprove that hypothesis. You test the hypothesis using that experiment. Other scientist should be able to repeat your observation, which means the experiment needs to be described carefully. Typical use of this method is to pose a solution to a problem and find some way of accepting or rejecting that solution (Holton, 1975). This should be called a method and not a theory.

Systems analysis accepts and uses the scientific method in the requirement for careful explanation of processes so that other analysts would make the same judgments and reach the same conclusion based on those explanations. There is also a commitment to the theories developed by science related to the system development and system processing. Systems analysts the scientific rules for how things operate are reasonable.

THE SYSTEMS APPROACH

A system is a complexity of possibilities so that a one can not trace all the possible actions. Any system whether it is a biological, societal, mechanical, or a computer system follows the rules for systems. The complexity establishes this (von Bertalanffy, 1962). I consider systems an approach rather than a theory.

To understand the system one must divide the system into parts to even begin to studying it. But since the whole is more than the sum of the parts (because of all the interactions) the study must be done iteratively, in order to include as many interactions as possible.

The starting point of computer system analysis is Input, Process, Output (Figure 3).

THE SHANNON MODEL

Much of our work with computer systems assumes Shannon's model of communication, within the system (Figure 4).

A sender has information to send. The information is encoded so it can be sent by some means. Then the information is carried by a channel.

Figure 1.

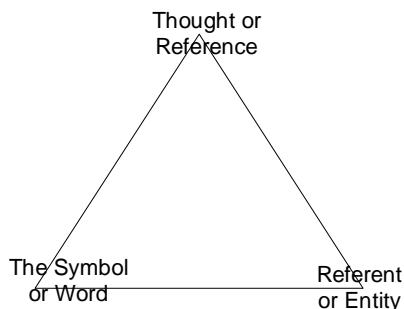


Figure 2.

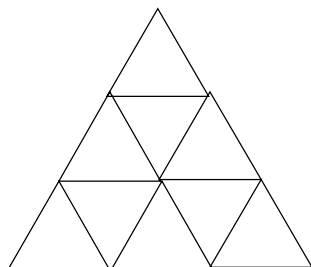


Figure 3.

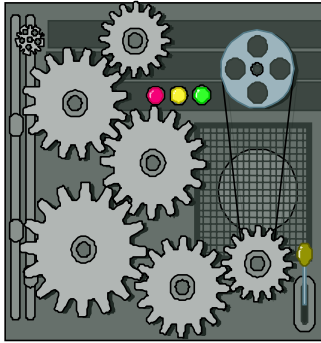
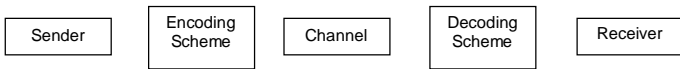


Figure 4.



The information is then decoded so a receiver can interpret it (Shannon and Weaver, 1949). This is a structural model of communication.

To understand the exchange of information in a computer system one must have some sort of model. Thus we generally use a structured theory of communication and the Shannon model of communication which is in agreement with the structured theory.

PHENOMENOLOGY

The conscious experience of the individual is the route to discovering the reality (or the meaning) of things. That is phenomenology (Husserl, 1962).

This is generally used in the interpretation of texts, but also used to interpret social situations as though they were a text. You must distinguish between the “text” and the “context” of the text (or of the social situation). The meaning is found by understanding the context (Dilthey, 1972).

Ultimately the meaning is in the back of the mind (Husserl, 1962).

If a tree falls in the middle of the woods is there a sound?

Phenomenology would say “No”.

Of course to scientists the sound is a physical activity and has nothing to do with whether we perceive the sound in the back of our minds (Figure 5).

SYMBOLIC INTERACTIONISM

Interactionism argues that meaning is constructed through interaction (Mead, 1934).

Meaning is the product of all our experiences. What we think, and even who we think we are, is constructed by our interactions with others. We learn through a social context (Vygotsky, 1978).

Figure 5.

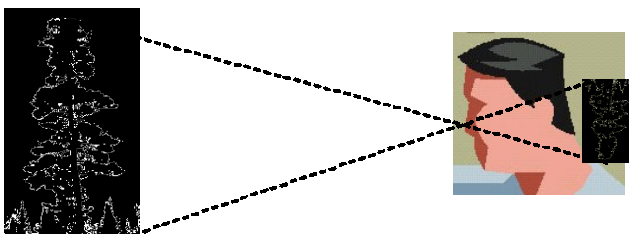
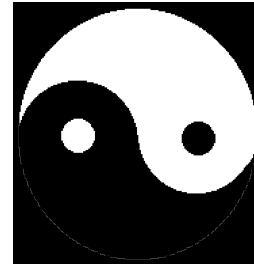


Figure 6.



Wittgenstein (1969) – the meaning of a word is in its use.

In this theory, meaning is never absolute. Today’s interaction can cause a “new world” of thought. This communication theory makes sense out of the fact that our understanding of meaning changes over time and with new experiences.

This is a particularly important theory since it shows how the changes in technology (information systems) can change how we approach meaning. Shannon’s theory is good for understanding the technology of systems. **Interactionism can help us understand the social and cultural implications of systems.**

This is a proto-post-structuralist view of truth and understanding. These ideas do not deconstruct the semiotic structure of meaning but question its absoluteness and rigidity. Meaning is never certain and can change through social interaction or is limited in certainty due to the reality of language processes.

POST-STRUCTURALISM

The pure structured approach has definite inadequacies and these inadequacies need to be exposed. Most of the theories discussed above (except interactionism) are structural. The goal of post-structural thought, is to understand that we as humans take the structure of meaning too seriously.

For the structuralist the meaning itself and the structure of that meaning can become the center instead of whatever reality or accomplishment we desire to emulate. The structure (the requirements definition) becomes an end in itself (Berman, 1988).

Because the structure of meaning varies from one person to another we tend to talk past each other or ignore each other. This is particularly true in arguments over requirements. Most post-structuralists, and there are many varieties of post-structuralism, consider the meaning to be within the discourse and not in either the text or the context. Then discourse analysis takes on a more important role.

Discourse analysis is used to deconstruct arbitrary structures of meaning. This is particularly true of the changes in worldview or conceptual structure over time (Foucault, 1972). Ultimately meaning cannot be held in a inflexible structure.

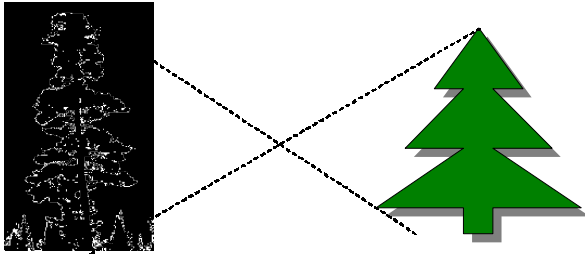
SYSTEM METHODOLOGIES AND UNDERLYING THEORIES AND METHODS

The Yourdon methodology is based on a structural theory of communication. The results of the analysis and design become the ultimate structure (of the system), at least in the minds of the analysts.

If the systems requirements, as developed by this process, are questioned or changed, the apparent absoluteness of the structural view of the system is put into question. The structural theory assumptions make it difficult to make changes in the requirements even if there are no other problems with the changes

.The problem, then, is not necessarily a problem of changing specifications as it is a problem of philosophy. Post-structuralists criticize this problem which always occurs with the use of the structural theory. The

Figure 7.



proposed structure of meaning (or the proposed structure of the system) tends to have more reality to the structuralist than the reality it was meant to represent. The structure of reality cannot be perfectly duplicated in the context of human communication.

AGILE SYSTEMS METHODS CAN BE VIEWED AS INTERACTIONIST

The ability, of Agile systems, to change as new information arises is more akin to an interactionist viewpoint. Here the activity is not to obtain a truth (the requirements), that becomes immutable, but to seek solutions that solve the problem the user has. The interaction with the users holds the meaning.

The method is not to create a structure that is truth, but the method is a sum of all the interactions that are relevant. Meaning, or the meaning of the system, is created in the interaction with all the stakeholders of the system.

Agile analysis rejects the structured view of requirements analysis but does not reject the systems approach. That is, agile analysis recognizes the fact that the system is more than the sum of the parts and systems solutions require an iterative analysis. Agile analysis also accepts the scientific method.

The problem with agile methodology is the minimization of documentation and the difficulty of establishing clear contractual obligations before the work begins.

AGILE SYSTEMS METHODS ARE ALSO POST-STRUCTURALIST

Agile is also post-structuralist. The aim of post-structuralism is to reveal the weaknesses and failures of structural methodologies.

The very definition of Agile methodology, as expressed in the Agile Manifesto, demonstrate de-struction. The solutions from these methods are not necessarily or likely to be structured in character.

The solutions are obtained through deconstructing the structural methodology. This deconstruction is done through a discourse with the users and stakeholders of the system. In this discourse the system itself is present as a prototype during the process. The refactoring process is a discourse between developers through the code of the system.

The agile methodologies are definitely post-structuralist. Agile methodologies is presently the most practical use for post-structuralist thought.

REFERENCES

- Berman, A., (1988). *From the New Criticism to Deconstruction: The Reception of Structuralism and Post-structuralism*, University of Illinois Press: Urbana.
- Dilthey, W., (1972). "The Rise of Hermeneutics," [Jameson, F., Trans], *New Literary History*, No. 3.
- Eco, U., (1976) *A Theory of Semiotics*, Indiana University Press: Bloomington.
- Foucault, M., (1972). *The Archeology of Knowledge*, [Sheridan Smith, A. M., Trans], Pantheon: New York.
- Holton, G., (1975). "Science, Science Teaching, and Rationality." in *The Philosophy of the Curriculum*, [Hook, S. Ed], Prometheus Books: Buffalo.
- Husserl, E., (1962). *Ideas: General Introduction to Phenomenology*, [Gibson, W. R. B., Trans], Collier Books: New York.
- Mead, G. H., (1934). *Mind, Self, and Society*, University of Chicago Press: Chicago.
- Ogden, C. K. and Richards, I. A., (1923). *The Meaning of Meaning*, Kegan, Paul, Trench, Trubner: London.
- Peirce, C.S., (1958). *Selected Writings*, [Wiener, P. O., Ed], Dover: New York.
- Shannon, C. and Weaver, W., (1949). *The Mathematical Theory of Communication*, University of Illinois Press: Urbana.
- von Bertalanffy, L. (1962). "General Systems Theory: A Critical Review." *General Systems*, No. 7.
- Vygotsky, L.S. (1978). *Mind in Society*. Harvard University Press: Cambridge, MA.
- Wiener, N. (1961). *Cybernetics or Control and Communication in the Animal and the Machine*. MIT Press: Cambridge, MA.
- Wittgenstein, L., (1969). *On Certainty*, [Trans. Paul, D.], Blackwell: Oxford, UK.

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