

Some Multifaceted Relationships Between Semantic And Syntactic Aspects Of Communication: An Elaboration Of Phenomeno-Semantic Complexification

Abstract

Recently, Eriksson (2007) proposed a novel notion of complexity as a complement to the currently dominating idea. The dominating idea perceives complexity as emerging out of interactions of adaptive agents that are governed by local rules, while Eriksson's proposal for "phenomeno-semantic complexity" in human affairs conceives a complexity that emerges out of the unintended transformations in the communication processes between sense-making actors. While Eriksson's proposed model is potentially an important contribution to the understanding of complexity in human affairs, in its present form, it mainly addresses what such a complexity is and why it emerges. However, it says little about the detailed mechanisms that produce such phenomeno-semantic complexity. This lack, in turn, limits the development of concrete strategies for how to manage successfully phenomeno-semantic complexity in human affairs. The present text proposes one way of how to remedy this limitation. Living Systems Theory, as proposed by J. G. Miller, is here introduced followed by a conceptual elaboration where several components from Miller's theory are incorporated into Eriksson's model of phenomeno-semantic complexity. The benefit of this synthesis is that the introduced components provide conceptual tools that support us in understanding how phenomeno-semantic complexity emerges in human affairs and by derivation for the consequent design of strategies for how to practically deal with it.

Introduction

Eriksson (2007) introduces a model of semantic complexification that complements conventional notions of complexity. The dominating conventional approach is to base

complexity in the interactions of adaptive agents. The model of semantic complexification identifies a novel kind of complexity that derives “from syntactic and semantic transformations in the communication process between sense-making actors” (p. 11). It thus elaborates the conventional approaches of *interaction* into *communication*, with emphasis on unintended transformation of meaning.

Millers’ (1978) Living Systems Theory (LST) is an elaborate, conceptual framework that concerns processes of matter, energy, and information. It characterizes living systems as such processes and structures, identifying twenty critical subsystems that recur at eight hierarchal levels of types of living systems. Sense-making actors and the suprasystems that they introduce are living systems in Miller’s conceptualization. LST, consequently, informs the model of semantic complexification.

The model of semantic complexification incorporates a coding function that introduces certain semantic transformations into message. LST elaborates the coding function into two critical subsystems and three basic types of codes. The model further identifies a certain syntactical transformation without associating a function with it. LST informs that transformation with three critical transducer subsystems. Finally, the notion of sense-making, itself, is informed by the LST learning subsystems.

The following section presents a summary of the phenomeno-semantic complexity as recently proposed by Eriksson. Thereafter, a short overview of Miller’s Living Systems Theory is given, followed by particular focus on the components that are to be elaborated into the phenomeno-semantic model. The elaboration is presented in turn, and the paper ends with a summary and some suggestions for future investigations.

The Model of Semantic Complexification

Eriksson (2007, p. 11) characterizes a conventional notion of complex systems as “the interaction of adaptive agents governed by local rules giving rise to unpredictable global behavior.” He then proposes a different but complementary idea of the complexity of such systems. That novel complexity arises in the process of semantic and syntactic transformations of message as communicated between sense-making actors. Eriksson terms the conventional type of complexity *ontological syntactic* and his novel notion *phenomenological semantic complexity*.

He bases his introduction of phenomenological semantic complexity on two widely discussed models—the Ogden and Richards (1985) triangle of meaning and the Shannon and Weaver (1949) model of communication. According to Ogden and Richards, meaning arises in the relationships among the three constitute elements of *idea*, *thing*, and *term*. The idea is private to each individual, a mental concept, meaning. The thing and the term are public, accessible by multiple individuals. The thing is the object, referent, that which the idea is about. The term is symbol or signal that represents the idea. When two individuals attempt to communicate about a thing, they employ terms and things. Shannon and Weaver model communication by acknowledging that an idea must be formalized into a symbol that can be physically transferred from a sender to a receiver. That process involves the encoding of the idea by the sender and the decoding of the symbol by the receiver. Eriksson identifies semantic transformations between the idea of the sender and the symbol and between the symbol and the idea of the receiver.

Objecting to the logical positivism of the Vienna Circle and its focus on the formalization of the idea (formal semantics), Eriksson evokes Naess’s (1953) empirical semantics. Naess

asserts that no one-to-one direct and exclusive relationship exists between our expressions (terms), and the meanings we assign to them. Furthermore, no such relationship exists between our meanings (ideas) and the actual situations (things). With the introduction of Naess, Eriksson compounds the probability of unintended semantic transformations of meaning in the communication of sense-making actors, and elevates the significance of *phenomenological semantic complexity*.

Eriksson rounds out his introduction of this novel complexity with Quastler's (1964) model of transition transformation. The model shows that a receiver receives only part of a sender's message and that a receiver also receives some message the sender did not send. That which Naess did for Eriksson's model of semantic complexification in terms of semantics, Quastler does in terms of syntactics. "Naess's empirical semantics articulates the semantic transformation (i.e., transformation of meaning, idea, concept" (p. 16). "Quastler's model of transition transformation articulates syntactic transformation (i.e., transformation of code, symbols, signal term)" (p. 16).

Eriksson distinguishes between conventional *ontological syntactic complexity* and the communicative *phenomenological semantic complexity*. The conventional approaches are characterized by three identifiable general qualities—(1) naturalism, (2) syntactic orientation, and (3) objectification. The empirical observations that found the induction of theoretical propositions are mostly of physical, chemical, and biological phenomena. The understanding of the complex behavior observed in the phenomena "emerges from numerical simulation models using a set of rules guiding the interaction of the constituting components . . . shown by syntactic manipulation – that is, by representation – rather than focusing on the pragmatic and semantic aspects" (p. 13). The studies mainly focus on observed systems and "do not seriously account"

for the observing system (p. 13). They assume a direct correspondence between the model and the modeled phenomena – a sort of ontological representation.

The phenomenological semantic complexity approach may be characterized as socio-psychological with a semantic orientation that incorporates observing systems into the model.

Eriksson summarized the key concepts of this approach in the following manner (Eriksson, 2007):

Triangle of meaning of sense-making actor: The indirect relationship between an idea conceived by a sense-making actor and the object that this idea refers to, and then the symbol or signal that aims to represent the idea and hence also the object of reference.

Phenomeno-semantic complexity: When communicated, meaning is unintentionally transformed – syntactically and/or semantically – in the process of transmission between two sense-making actors, which may lead to an action on the part of the receiver that cannot be predicted by the sender, hence the emergence of complex behavior.

Semantic transformation: Occurs in the process of transferring a message between two sense-making actors, and refers to the experience when the meaning that is received by the receiving sense-making actor is unintentionally different from the one that was sent by the sender; is caused by either formalization noise or interpretation noise.

Syntactic transformation: Occurs in the process of transferring a message between two sense-making actors, and refers to the experience when the symbols or signals, representing the meaning to be transferred, are transferred or changed unintentionally.

Formalization noise: Occurs when a sender assigns a symbol or signal to an idea to be communicated to a receiver, thus formalizing the idea, while the selected formalism cannot represent the intended idea, as perceived by the receiver.

Interpretation noise: Occurs when a symbol or signal is received by a sense-making actor, who then assigns some meaning to it, which differs from the one that was intended by the sender of the signal or symbol.

First-order semantic complexification: The process of semantic complexification, as described in the first line above, which emerges in the subject system in the inquiry of an object system; i.e., in the process of communication between sense-making actors that investigate a phenomenon, such as a team of business analysts.

Second-order semantic complexification: The process of semantic complexification, as mentioned above, which emerges in the object system in the inquiry of an object system;

i.e., in the process of communication between sense-making actors constituting the investigated phenomena, such as an enterprise.

Eriksson's approach references a complexity that emerges in communication among agents, particularly among sense-making actors, that is complementary to the conventional view. The *communication* processes, as the *interaction* processes of the conventional view, result in unpredicted complex behavior. Eriksson examines the sources of that unpredicted behavior from the vantages of semantic and syntactical transformations.

Living Systems Theory

Living Systems Theory (LST) is a general scientific theory (Miller, 1978). The empirical observations that found the induction of theoretical propositions are physical, chemical, biological, and social. More specifically, LST identifies living systems at eight levels of complexity – cells, organs, organisms, groups, organizations, communities, societies, and supra-national systems.

By including social levels of systems, LST is forced to acknowledge the encapsulation of the observer in the system being observed with all of the influences that devolve therefrom. Miller does that by drawing a distinction between *concrete* and *conceptual systems*. “A *concrete, real, veridical* system is a non-random accumulation of matter-energy, in a region in physical space-time, which is organized into interacting interrelated subsystems or components” (Miller, 1978, p. 17). Conceptual systems consist of units and relationships. *Units* are “terms, such as words (commonly nouns, pronouns, and their modifiers), numbers, and other symbols, including those in computer simulations and programs” (Miller, 1978, p. 16). A *relationship* is a pair of units, “each being ordered in a similar way” (p. 16). Relationships are verbs and their

modifiers, logical or mathematical symbols, and operations of computer simulations and programs. “The language, symbols, or computer programs are all concepts and always exist in one or more concrete systems, living or nonliving . . . The conceptual systems of science exist in one or more scientific observers, theorists, experimenters, books, articles, and/or computers” (p. 16).

Conceptual systems always involve the subjective. When concrete systems are targeted, the subjective is embodied in the observer. Miller states, “The *observer*, for his own purposes and on the basis of his own characteristics, selects, from an infinite number of units and relationships, particular sets to study” (p. 16). The complexification that emerges from that selection process ultimately concerns *meaning*, a form of information the measurement of which is yet undeveloped.

LST characterizes living systems as processes and structures of matter, energy, and information, as concrete systems existing in space-time. Structures are arrangements of matter-energy elements at a moment. Structure always changes over time. Processes are changes in structure over time. Processes that are readily reversible are termed *functions*. Processes that are less readily reversible and change both structure and function are termed *history*. Information is the formal patterning of the matter-energy elements comprising a system. The matter-energy elements constitute the information markers. For it to be moved in space or retained over time, information must be borne on such markers.

From the perspective of a living system, the processes that give rise to the changing structures are viewed as inputs, throughputs, and outputs. For a living system to endure, those “puts” must organize in ways that perform a certain minimum of critical functions. The processes and structures of those systemic elements are termed *critical subsystems*. Twenty

critical subsystems have been identified: two that process both matter-energy and information, eight that process matter-energy, and ten that process information. Whether inputs, throughputs, or outputs comprise matter-energy flows or information flows depends on how the living system uses the flows.

Information flows constitute communication. The twelve LST information processing critical subsystems, consequently, inform communication. Those subsystems are: reproducer, boundary, input transducer, decoder, internal transducer, channel and net, associator, memory, decider, timer, encoder, and output transducer. Here we concern ourselves only with those most closely associated with Eriksson's development of the model of semantic complexification, i. e., the coding subsystems, the transducing subsystems, the channel and net subsystem, and the learning subsystems.

The Encoder and Decoder Subsystems

The encoder subsystem “alters the code of information input to it from other information processing subsystems, from a ‘private’ code used internally by the system into a ‘public’ code which can be interpreted by other systems in its environment” (Miller, 1978, pp. 68-69). The decoder is “the subsystem which alters the code of information input to it through the input transducer or internal transducer into a ‘private’ code that can be used internally by the system” (p. 64).

Coding subsystems also develop in groups, organizations, and so on. Those coding functions are superordinated to those of the individual humans that comprise the higher level living systems. Each level compounds the possibility of semantic complexification by coding. For example, a group of experts from Japanese, German, and American companies come together to develop a joint enterprise. They agree to communicate in English. Although the

Japanese and German representatives speak common English well, they bring skilled interpreters to mitigate misunderstanding. They also bring lawyers and accountants skilled in the law and standards of the different societies in which the organizations are chartered. And, the example can go on and on to incorporate ultimately all aspects of the joint enterprise right down to quality standard for production. While each individual participant is biologically encoding and decoding at the organism level, the interpreters are performing those processes at the group level, introducing additional possibility of semantic complexification.

The LST concept of coding is an elaboration of information flow, also termed *communication*. Information, being the formal patterning of the organization of concrete systems, always is borne on *markers* (matter-energy forms). In that context, the following three basic types of codes occur. “An *alpha code* is one in which the ensemble of markers is composed of different spatial patterns of structural arrangement of physical artifacts, like door keys or chemical molecules” (Miller, 1978, p. 64). “A *beta code* is one based on variations in process, such as different temporal patterns of signals or different patterns of intensity of signals. Such codes are used by living systems which have decoders and encoders with stable programming whereby they can change an input code into a different output code. Neurons do this. A *gamma code* is a symbolic language used by systems which have decoder and encoder subsystems that alter the code on the input markers to a different one on the output markers by comparing the input to a stored thesaurus of information and selecting the output from it. The relations between the symbols on the input and output markers in such codes are entirely arbitrary. This sort of symbolic information transmission is ordinarily dealt with when communication is discussed in the social sciences” (p. 65). Does Eriksson’s phenomeno-semantic complexity arise from Miller’s gamma coding? If so, is it necessarily error in the sense

of Shannon's mathematical system? Might it, in fact, be a definitive source, among others, of the ambiguity in social order? To what degree are the arbitrary actions of sense-making actors the result of arbitrary sense-making?

The three types of codes exhibit a general pattern of emergence in the hierarchy of increasing complexity in living systems. Alpha code predominates at the bio-chemical level, beta code predominates at the organ and organism level and gamma code underlines communication at the social levels of group, organization, community, society, and supranational system. All three codes, however, continue to be important at each higher social level. When members "size up" each other during the initial meeting of a group, they are employing both alpha and beta coding as well as the obvious gamma coding. Some aspects of the alpha and beta coding are commonly termed *body language*.

Perhaps the single most important advancement of the information age has been the development of means to encode gamma codes into beta codes and, in turn, beta codes into alpha codes—and then to reverse the process. This has been accomplished by discovering basic linguistic-mathematical logic underlying gamma coding and using that understanding to invent means of translating language and mathematics to analog code and finally to digital code, and then reversing the process.

Input, Throughput, and Output Transducer Subsystems

The transducer subsystems differ from the coding subsystems in that the transducers are concerned with the changing of information markers into other matter-energy forms, whereas coding is concerned with the representation of one ensemble of signals with another. Miller (1978, p. 62) defines the input transducer as "the sensory subsystem which brings markers

bearing information into the system, changing them to other matter-energy forms suitable for transmission within it. Input markers are formed by significant alterations in the environment. Each one is of a particular spatial structure, wavelength, bandwidth, or intensity. The transducer changes them to other matter-energy forms suitable for further transmission within that specific system.” The internal and output transducers are defined similarly with deference to their systemic positions.

The interrelationship of the coding subsystems and the transducing subsystems may be illustrated with a major problem that arose in the emergence of cyber-commerce. That problem was how to introduce money-information into cyber-space. Money-information is a special kind of communication that is more powerful than most other kinds because it is more apt to elicit behavior on the parts of the transmitters and receivers (Miller, 1978, p. 844-845, 1047). Swanson, Bailey, and Miller (1997) distinguish *money-information* from *monetary information* on the subjective doubling of meaning between the terms *information* and *negentropy* (information \Leftrightarrow negentropy) introduced by Beauregard (1961). Money-information is *power of organization* within a system and monetary information is *about a system*. Monetary information may be replicated without changing its informational characteristics. Money-information alternatively derives its informational characteristics in part from scarcity. There, duplication destroys. The characteristic of money-information evolved over a long period beginning in prehistory and culminating with the invention of coins in about 700 B.C. (Swanson and Miller, 1989, pp. 28-53). Those characteristics have been maintained mainly by controlling the information markers. The control of the symbols, while important and necessary, has been secondary. That is to say, the information transducer subsystems have been prominent, with the coding subsystems taking a necessary but second position. In cyber-space all information

markers are essentially similar. So ways of transmitting money-information were required that changed the emphasis from transducer subsystems to coding subsystems. Password protected and encrypted coding systems were developed along with various other internal controls. Coding became prominent. But, given the power of money-information, more was needed. Channels emerged that are dedicated to the transmission of money-information only. These involve Miller's channel and net subsystem.

Channel and Net

The channel and net is "the subsystem composed of a single route in physical space, or multiple interconnected routes, by which markers bearing information are transmitted to all parts of the system" (Miller, 1978, p. 3). As higher level systems emerge, each of the critical subsystems at the higher level may develop for itself all twenty critical subsystems as subsystems. For example, certain full functioning companies own, build, and maintain transmission lines over which communication occurs among social units and individuals. All critical subsystems may be identified at an organizational level within those companies. The companies themselves functions as channel and net subsystems of the society in which they are located.

Channels and nets are limited as to the amount of information they may process per time. They may be overloaded. Miller identifies certain adjustment processes used to cope with increasing information input overload. The five main ones are identified as: 1. omission; 2. error; 3. queuing; 4. escape; and 5. chunking. *Omission* is the failure to transmit certain randomly distributed signals in a message; *error* is the incorrect transmission of certain signals in a message; *queuing* is the delay of certain signals in a message; *escape* is the action of stopping information input; and *chunking* is transmitting organized packages of symbols instead of doing

so symbol by symbol (applies only to symbols that convey meaning in terms of a receiving systems' previous learning). At higher levels of living systems, these basic adjustment processes intertwine to form even more complex processes. Such adjustment processes seem surely to inform the semantic and syntactical transformations identified by Eriksson.

The Learning Subsystems

Miller (1978, p. 65-67) identifies association and memory as learning subsystems. The *associator* is "the subsystem which carries out the first stage of the learning process, forming enduring associations among items of information in the system . . . The synthesis formed is at least somewhat different for each individual system, in the items involved and sorts of relationships among them." An example at the organism level is the construction of acronyms by graduate students to remember critical details for an exam and, one at the organization level, the construction of an exhaustive set of accounts in which to record financial information

Complex association of the gamma coding, which is assumed in the concept of sense-making, could not occur without memory. Memory is information storage. Memory is traditionally thought to occur as a result of association. The association of gamma coding, nevertheless, occurs as it is compared to a lexicon of remembered meaning. Obviously, the learning subsystems have a certain developmental unity. But, that is characteristic of all of Miller's subsystems. A key descriptor of living systems is "their subsystems are integrated [I would say, integrating] together to form actively self-regulating, developing, unitary systems with purposes and goals" (Miller, 1978, p. 18).

The Elaboration of Living Systems Theory

Into the Model of Semantic Complexification

An elaboration of LST into the model of semantic complexification may instruct a dual extension of the model. It may extend the model, at a similar level of abstraction, illuminating how phenomeno-semantic complexity emerges. That extension also reaches beyond considerations of the complexity that derive from coding to additional elements of communication. At a practical applications level, LST provides a framework of guiding principles and implications.

The extension at the model's level of abstraction requires the allocation of the LST subsystems discussed above within the communication processes between sense-making agents and definitions of the roles of the subsystems in that context. It should be noted here that this level of abstraction lies in the bounds of that which Miller (1978, p. 19) termed *abstracted systems*. "The units of *abstracted systems* are relationships abstracted or selected by an observer in the light of his interest, theoretical viewpoint, or philosophical bias. Some relationships may be empirically determinable by some operation carried out by the observer, but others are not, being only his concepts."

LST does not include the concept of intentionality. Miller constructed LST on the concept of concrete systems (defined above). Consequently, the introduction of a sort of mezzanine between the conceptual and the concrete at the level of abstraction contemplated by *phenomenological semantic complexity* contributes both to Eriksson's model and to LST.

The extension at the practical applications level avails advantageously the significant elaboration of LST into multiple aspects of social interaction. Founded on the guiding principles and implications of its core theory, LST identifies variables and indicators of the communication

processes between sense-making agents. It, consequently, can inform the observation and practical management of those processes.

This elaboration of LST into the model proceeds through the LST critical subsystems introduced above. The dual extension of the model is elaborated as it concerns each subsystem in turn. It may be useful for the reader to examine Figures 1 and 2 as an overview of the discussions that follow. Figure 1 is Eriksson's presentation of Shannon and Weaver's model, involving coding processes. Figure 2 inserts additional communication processes identified by Miller's LST.

The Role of Encoder Processes

Eriksson limits the scope of his discussion of coding to the articulation of the intentional—to its psychic quality. Unintentional transformations occur in the process of formalizing ideas into symbols—in coding—giving rise to phenomeno-semantic complexity. That complexity results from both semantic transformations and syntactic ones. Those sources of transformation may be elaborated by LST definitions of certain coding and other information processing subsystems.

Eriksson's discussion absorbs significant variety into the concept of coding. Miller identifies that variety, and his definitions of information processing subsystems provides a basis for its examination. The LST definitions, however, set severe limits on that examination. LST does not include intentionality as Eriksson includes it. In LST, purpose is a result of interactive flows of matter, energy, and information and of origin-introduced template. It is not a driver of action. It results from action. Nevertheless, LST provides a rich conceptual structure for the examination of encoding processes within and among groups and organizations. That

examination may well reveal means of mitigating to some extent phenomeno-semantic complexity.

An intermediary position between Eriksson and Miller, yet commensurate with Eriksson's level of abstraction, may be taken. The *role* of this encoding process may be defined as the intentional transformation of the meaning, or semantic content, of a private code used by the sender to a public code that may be interpreted by the receiver. The encoding process thus defined does not yet encompass any syntactic transformation or the initial formalization of idea into symbol. By including intentionality and excluding syntactic transformation and initial formalization of idea, we may exercise a union of the model of phenomeno-semantic complexity and LST. By that union, we may evoke LST to incorporate a minimum requisite variety in the model at a practical applications level. That variety includes not only encoding and decoding, but also input, internal, and output transducing as well as association and memory processes.

The Role of Decoder Processes

Decoding process differs from encoding process mainly in its position in the communication process. Encoding is exercised by a sender, while decoding is a receiver function. The semantic transformation, consequently, is from private to public code for encoding, while it is from public to private for decoding. The role of the decoding process may, therefore, be defined as the intentional transformation of the meaning, or the semantic content, or a public code received from a sender to a private code that may be interpreted by the receiver.

Decoding, thus defined, provides a similar access through LST to a practical applications level of examination. Because it introduces a second, if similar, point of origin of possible

phenomeno-semantic complexification, decoding thus defined enhances the requisite variety of Eriksson's model.

The Role of Output Transducer Process

Eriksson recognizes that a semantic complexification may occur in transducer processes without naming those processes. He identifies syntactic information with changes of message introduced by symbol transfer but does not consider the markers on which those symbols must be borne, the transducers. Failure of the eardrum involves both transduction and coding. In a particular situation, one may precipitate the other.

LST clarifies the distinction between coding and transducing as that between changing symbols and changing information markers on which symbols are borne. Conserving Eriksson's semantic complexification perspective, the *role* of the output transducer process may be defined as to intentionally transform the syntax, or the physical representation of the information, without transforming the semantic content, or meaning, of the information from a private marker that may be used by the sender to a public marker that may be transmitted to a receiver. Output transducing introduces a third point of origin of possible phenomeno-semantic complexification.

The Role of Internal Transducer Process

Miller demonstrates the importance of an internal transducer process in both biological and social systems. The emphasis of Eriksson's model is on the social systems of groups and organizations. At the social levels, intentionality may be introduced. In addition, certain types of markers may be favored by certain groups, such as face-to-face speech, email, or internet streaming. Consequently, an internal transducer process should be recognized to be occurring

within each of two communicating groups before messages are output transduced one to the other. The *role* of the internal transducer process may be defined as that process that intentionally occurs among components of groups, organizations, communities, societies, and supranational systems when any of those higher-level systems constitute a sense-making agent that, as such, communicates with another such agent. Internal transducing introduces a fourth point of origin of possible phenomeno-semantic complexification.

The recognition of an internal transducer function raises an interesting question about the possibility of an “internal” coding process. If social systems intentionally and internally transform syntax, why not semantic content? Are not the mediating spaces of Güney, Ing, and Simmonds (2004) dominantly “internal” coding processes of an emerging group? The identification of such processes may draw us even closer to establishing a minimum variety required by Eriksson’s model.

The Role of Input Transducer

The input transducer process is reflective of the output transducer process. Its *role* may therefore be defined as to intentionally transform the syntax, or physical representation of the information, without transforming, the semantic content, or meaning, of the information from a public marker transmitted from a sender to a private marker that may be used by the receiver. The input transducer process introduces a fifth point of origin of possible phenomeno-semantic complexification.

The Role of the Channel and Net Process

The *role* of the channel and net process is the intentional selection of a single route in physical space, or multiple interconnected routes, over which markers bearing information are transmitted. Both senders and receivers make such selections, and they may or may not select the same channel and net. In the context of the communication of sense-making agents, therefore, an “outward” channel and net and an “inward” channel and net may be identified. The degree of insynchronicity of the two introduces a sixth point of origin of possible phenomeno-semantic complexification. The acknowledgement that different channels and net may be selected by a receiver and a sender may inform the LST concept of channel and net as well.

The Role of the Associator Process

Miller identifies association as the first of a two-stage learning process, with memory being the second. The *role* of the associator process in the communication of sense-making agents is the intentional formation of enduring associations among items of information. Associator processes occur in both senders and receivers, and the interrelationships of items of information in each are unique. Associator processes, consequently, introduce the seventh and eighth points of origin of possible phenomeno-semantic complexification.

The associator process is involved with the initial formulation of idea into symbol and cannot escape the influence of an origin-introduced template. That influence, however, is tempered by the experience phenomenon, expressing in learning behavior. The association that results is conditioned upon not only the processes being explicated here but also upon the types of codes involved—alpha, beta, gamma—and the coping mechanisms (adjustment processes) used to counter increasing information overload—omission, error, queuing, escape, and chunking.

When Eriksson evokes *sense-making*, at the limit at least, he involves associative learning. And that, after all, seems to be the focus of the complexity he illuminates by introducing coding to the Ogden and Richards triad. He terms his alternative notion of complexity a *semantic* complexity. Semantics concerns *meaning*, and intellectual meaning is almost certainly connected in some way with Miller's concept of associator subsystem.

The Role of the Memory Process

The second step of the learning process, as defined in LST, is memory. Its *role* in the communication process of sense-making agents is the intentional storage of information. Most of the intentional communication at the levels of group and organization is gamma coded. Gamma coded communication requires a comparison of communicated codes to a thesaurus of stored information. It is quite obvious, therefore, that a selected coding of information, whether incoming or outgoing, is dependent upon a particular agent's thesaurus. In the memory process, consequently, occasion arises for ninth and tenth points of origin of possible phenomeno-semantic complexification.

Summary and Further Research

Eriksson, following on Simon's (1992) call for a switch of focus from information processing and its syntactic qualities to the semantic qualities of human decision making, introduces a phenomeno-semantic complexity theory. While his proposed theory is potentially an important contribution to the understanding of complexity in human affairs, in its present form, it mainly addresses what such a complexity is and why it emerges. It, however, says little about the detailed mechanisms that produce such phenomeno-semantic complexity, about how it

emerges. He, thus, suggests that “one area of theoretical insight that may merit further research into complexity in human affairs is the multifaceted relationship between the syntactic, the semantic, and the pragmatic aspects of communication and the actions it causes.”

This paper has taken occasion of Miller’s (1978) Living Systems Theory to extend Eriksson’s theoretical development from what phenomeno-semantic complexity is and why it emerges to how it emerges. Table 1 summarizes that extension. Once we have engaged the question of how, extension to the pragmatic follows naturally. Future investigations, consequently, should include the formulation of a method for the use of the LST extended model for phenomeno-semantic complexity and the generation of case studies of its application.

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Table 1
Summary of Proposed LST
Extension to Phenomeno-Semantic Complexity (PSC)

Critical Subsystem	Role in LST	Illustration	Role to PSC
Encoder	Alters private, internal code to public, external code	<ul style="list-style-type: none"> • Translate languages • Code communications • Write and edit • Publications 	Intentional transformation of meaning (semantic content) of a private code to a public code
Decoder	Alters public, external code to private, internal code	<ul style="list-style-type: none"> • Signal decoding • Foreign language translation • Telegraphers 	Intentional transformation of meaning (semantic content) of a public code to a private code
Output Transducer	Transmits information markers out of a system, changing them to forms that may be transmitted outside	<ul style="list-style-type: none"> • Spokesperson • Publications • Public relations department 	Intentional transformation of the syntax (physical representation of information) without changing semantic content from private to public markers
Throughput Transducer	Changes information markers from components of a system for transmission to other components	<ul style="list-style-type: none"> • Groups that make reports within an organization 	Intentional transformations of syntax among components of a system
Input Transducer	Brings information markers into a system, changing them to matter-energy forms that may be transmitted within	<ul style="list-style-type: none"> • Guards • Lookouts • Persons who report on social events 	Intentional transformation of the syntax (physical representation of information) without changing semantic content from public to private markers
Channel and Net	Interconnected routes by which markers are transmitted	<ul style="list-style-type: none"> • Telephone exchanges • Internet messaging 	Intentional selection of interconnected routes by which markers are transmitted
Associator	Forms enduring associations among items of information in the learning process	<ul style="list-style-type: none"> • Computer programmers • Persons who process organizational information • Management information systems 	Intentional formation of enduring associations among items of information
Memory	Information storage in the learning process	<ul style="list-style-type: none"> • Accounting system • Librarians • Specialists 	Intentional storage of certain information

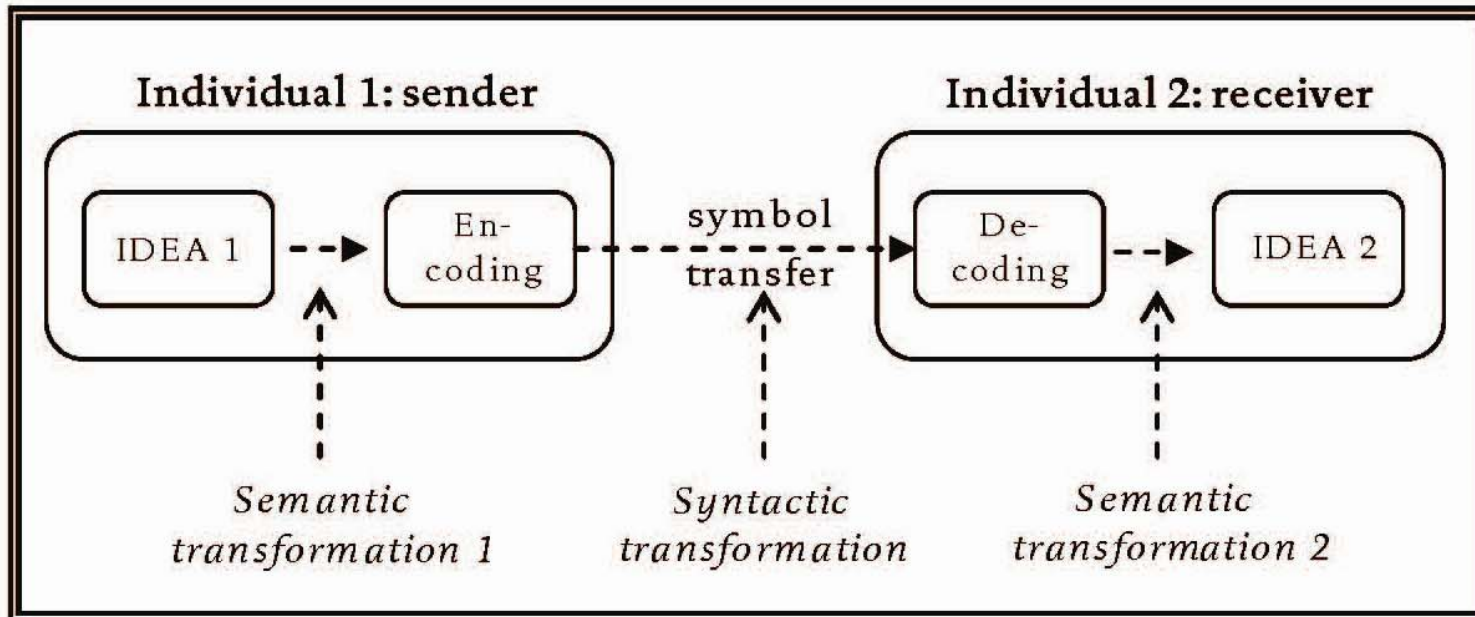


Figure 1

Shannon and Weaver Model

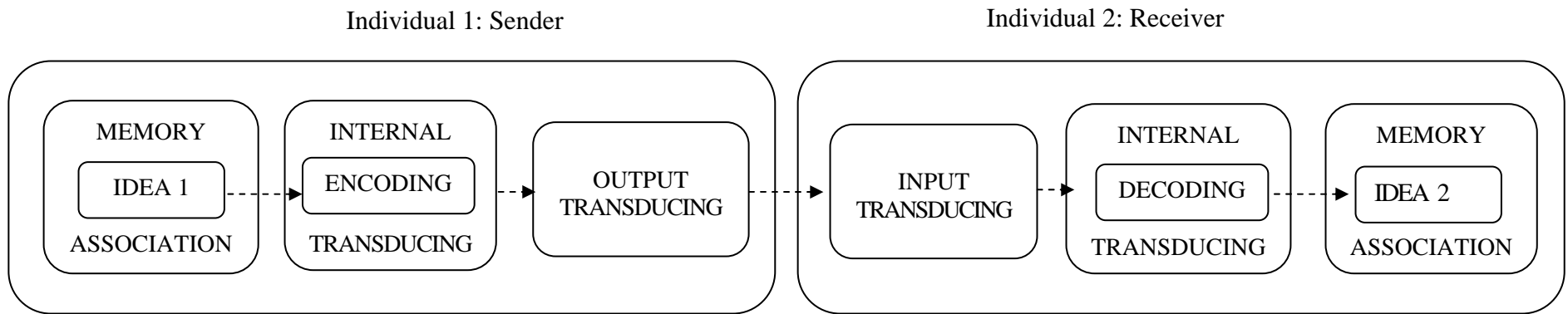


Figure 2

Shannon and Weaver Model with LST Subsystem Roles