

SIGNALLING CHANGES IN THE BUSINESS ENVIRONMENT IN THE INFOLOGICAL PERSPECTIVE. THE SIGNIFICANCE OF THE „WEAK SIGNALS” CONCEPT

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Abstract

Information and decision-making processes implemented in organizations moderate relations between the organization and its environment. The organization has a possibility to anticipate the states of objects owing to the ability to receive signals and interpret them correctly. The subject of the paper is the problem of signaling changes in the business environment by (weak) signals, presented in the info logical perspective which distinguishes the level of potential information attributed to an object, and active information attributed to the user. The aim of the paper is to show a problem which is cognitively interesting and still very poorly recognized empirically, namely the course and the conditionings of the effectiveness of the processes of perception and interpretation of (weak) signals about changes in the business environment.

Keywords: *signaling changes, weak signal, info logical perspective, environmental analysis.*

1. Introduction

Information and decision-making processes implemented in organizations moderate relations between the organization and its environment. The effectiveness of these processes depends on the ability to identify undergoing changes already at their very early stage. Therefore, it is necessary to anticipate the trajectory of development on the basis of the identified events which can be linked to discontinuities following them. Objects² in the business environment generate various signals, but their use in the decision-making process is conditioned by their perception and interpretation. The organization has a possibility to anticipate the states of objects owing to the ability to

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2 Any material object, a process, an event (their attributes), an abstract notion, the property of another object, etc. (Stefanowicz, 2004, p.14).

receive signals and interpret them correctly. The adaptation and development of the organization is a consequence of the use of information in making sense of changes, generating new knowledge, organisational learning and taking decisions.

The subject of the paper is the problem of signaling changes in the business environment by (weak) signals, presented in the infological perspective which distinguishes the level of potential information attributed to an object, and active information attributed to the user. Such an approach seems adequate considering the fact that changes undergoing in the environment are signaled, but only few organizations recognize them properly and use them in decision-making processes.

The aim of the paper is to show a problem which is cognitively interesting and still very poorly recognized empirically, namely the course and the conditionings of the effectiveness of the processes of perception and interpretation of (weak) signals about changes in the business environment. In this context, the following research questions seem relevant: what should be the scope of the observation of the environment and what sources of potential information should be used in recognition of changes in the environment (discovering potential information?) how should the interpretation of (weak) signals in the organisation proceed so that they could be transformed into active information, adequate to make decision with regard to changes in the environment? What are the barriers to the effectiveness of these processes, conditioning the progression of the recognition of changes in the environment?

For the needs of the problem defined in this way, the conceptual and theoretical research methodology was primarily applied, and the paper is of theoretical character due to the lack of significant empirical research concerning the subject thus defined. Therefore, the author is fully aware of the limitations arising from that and the necessity to treat the article as a contribution to the empirical research and further theoretical explorations.

2. Signals in the infological perspective

Objects, making up the statics and dynamics of the business environment, are a source of various messages supplying decision-making processes which we can analyze on two levels: datalogical and infological. The first of them, the datalogical level, enables to analyze information as potential. This level is objective information, occurring regardless of the object observer. The datalogical level is information which is a relation defined on the elements of the message K , which is $I(K)$. The message itself is defined as $K:=p(O,A,t,v)$. The system of K thus defined is a predicate p describing object O , where A is an argument of the predicate specifying the aspect of the description, in

specific time t and in the conditions v (Stefanowicz, 2004, pp. 13-22). Every object communicates specific information, thus, we can say that information is the content of the message. The other level, the infological one, enables to consider information as active. This is subjective information occurring in the context of its user, the problem being solved and the decision-making process. It considers the process of reception of $I(K)$ by user U in the context of task Q being solved, namely $I(K, U, Q)$ (Stefanowicz, 2004, pp. 13-22). Every message carries a content on the datalogical level, and it depends on the user whether it will be possible to read it on the infological level. What is crucial in this perspective is message K which consists of the ordered set of signals being a material vehicle of information.

Based on information theory, the signal is one of the basic terms related to its flow, it notifies about something, transmitting information from the source of the signal to the receiver (Oleński, 2001, p. 75). Signal sensemaking makes a sign of it, which "...*signifies* an object in a given information system (...), namely, it contains specific information if in a given system there is now, there was in the past, or there may be in the future an event, an object, a process or their qualities belonging to the semantic field of this sign" (Oleński, 2001, p. 85).

Pierce (1990) relates signal with sending a message, and information by means of it. This approach is connected with Shannon-Weaver general communication model (Griifin, 2003, pp. 23-56). Within this model, the information source (object) sends a message (through the transmitter (medium) encoding it into a signal), towards the destination (receiver), who, owing to the receiver (signal receiver) decodes it into a message. On the way, the signal mixes with noise, which may hinder its reception and interpretation. Coffman (1997) talks about signals as events during which objects transmit messages during an action or as its result. It is the transmission of an analog or digital pattern via any medium from the sender to the receiver, and the signal receiver can but does not have to be fixed, defined. The message is some information transmitted by its source (sender) which does not have any sense as such, it makes it only on the reception by the receiver and situating it in the interpretational context. The signal does not have to have a specific receiver, that is the object occurring in the environment is a vehicle of information, but it does not have to be addressed to anybody in particular. As Herbig and Milewicz (1996) write, signals are data from which organizations can (but do not have to) draw conclusions. Signals are emitted by objects (they are related to them) in a continuous way, filling the information space, whereas the existence of the receiver is not important. Thus, signaling is more informing than communicating (Martyniak, 1997, pp. 5-6). In such a perspective, transmitting information $I(K)$ is a passive attribute of objects and not their

live action. Only their reception and interpretation by a specific user creates knowledge resulting from the message carried by signal I (K, U, Q).

The message carried by a set of signals indicates its meaning for the user. The message has the same amount of information regardless of the usefulness for the receiver, but it may have different meaning and content for different receivers. Trzcieniecki (1976, p. 131) pays attention to it, stressing semantic and distinctive relations which occur between sign systems while encoding and decoding a message. It is particularly important for making decisions which depend on the level of understanding the decision-making context, and their correctness depends on the compatibility between the information and the decision. He presents the process of transforming the signal emitted by the object into a message (Figure 1).

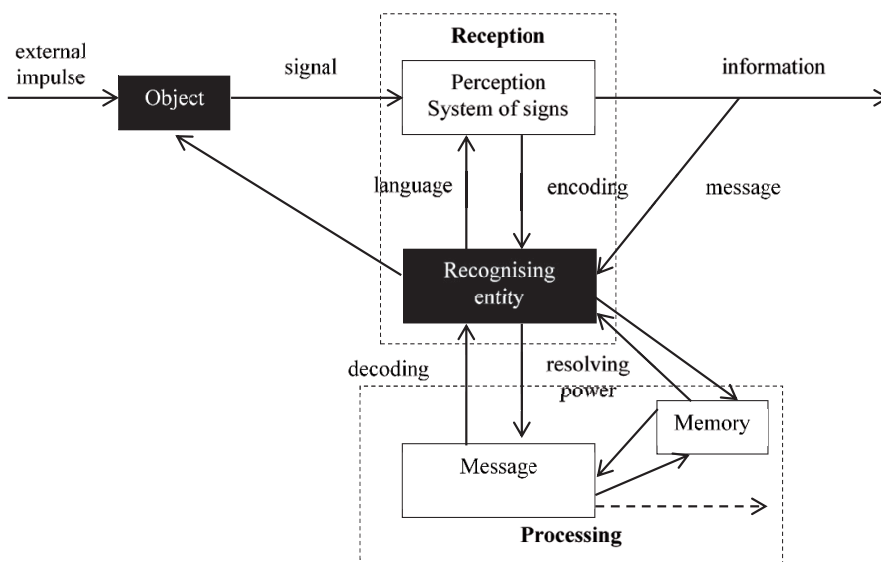


Figure 1. Information process diagram

Source: Trzcieniecki (1976, p. 131).

The task of the realized encoding and decoding processes is to order the sign system effectively, which is supposed to enable correct information processing, which is to lead to an understanding of the information included in the specific message signaled by a specific object. Understanding expresses resolving power which indicates the relation of the unambiguity between the information and the message attributed to it. In the next steps the message is used (or not) to make a decision and initiate an action (Trzcieniecki, 1976,

pp. 130-132). The transformation of signals into knowledge (Figure 2) is a result of two complementary processes: the first one is data ordering and their structuring (the process applying or discovering a pattern), and the other one is their understanding by the user (the sensemaking process).

A specific observer is exposed only to a certain fragment of the environment and pays attention only to some objects in the business environment due to physical and cognitive limitations. In the process, owing to the abilities to influence each other, which is an important mechanism in the process of facing the surrounding world, the user indicates objects in the environment to himself, and in this way manages an action. The indicated signals are extracted from the context, they obtain physical structure and sensing is made, the usefulness of the information carried by them for an action is assessed. Indicating objects and receiving signals is an uninterrupted process of information flow within which the observer perceives signals, assesses them, makes sense (by applying specific cognitive structuring) and gives significance to them, on the basis of which he takes decisions about undertaking a specific action. So that data could become information, the observer has to use the possessed interpretation patterns and by means of words and images to present data and relations among them in the way understandable to others, to enable not only intrapersonal but also interpersonal interpretation. Information becomes knowledge when users formulate and constitute the socially justified belief about their meaning.

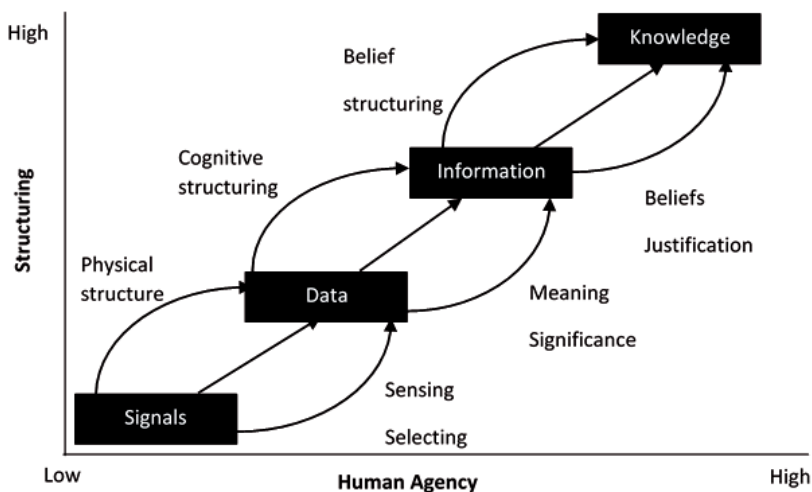


Figure 2. Signals, data, information and knowledge

Source: Choo (2006, p. 131).

To sum up, the signal is any object O which is a material vehicle of message K and transfers information with specific attributes of the object. The notion of the signal is inseparably connected with the notion of the message, and after adding meaning and value, with the notion of information. The information flow is possible exactly owing to the transmission of various types of signals. Information (on the infological level) is related to interpretation processes arising from the reception by a specific user, therefore, information potential of the signal is not constant, and the content of the message can be read variously.

3. Signal strength and the level of the semantic field ambiguity

Every signal is a vehicle for a message which makes sense only on the reception by the receiver and placing it in the interpretational context, namely at the moment of attributing semantic field to it and making a sign out of it. As it was mentioned before, very often signals do not have a specific receiver, that is, objects occurring in the business environment are the source of information, but it is not addressed to anybody. Oleński (2001, pp. 110-112) points to three types of signs in socio-economic systems: (1) natural signs, namely symptoms, (2) iconic signs, namely images (3) commonsigns, namely symbols. The first type of signs (natural signs) are characterized by unintentional formation, and the second and the third type of signs are formed purposefully. In the context of the deliberations on signals, we are interested in natural signs; that is symptoms, not generated intentionally to pass information, but perceived by the receiver as signals informing about something. Thus, any object becomes a symptom (of something), owing to the fact that the receiver perceives it and reaches semiosis (it is conditioned by the occurrence of an object and the observer's knowledge). Without that, a real object (the source of a signal) will not become a symptom, namely a sign being the representation of information. We can talk about three types of symptoms: (1) prospective, (2) retrospective, (3) ongoing. Considering the context of the deliberations, we are interested in prospective symptoms which carry information about the directions of changes (Oleński, 2001, pp. 110-112). Symptoms which constitute signals emitted by objects with the sense made to them are characterized by various level of the semantic field ambiguity. The semantic field of a given sign is unambiguous when: "... in the case of each identified object (...) in a given socio-economic system, on the basis of the semantic principles of a given language we can univocally judge whether the object (...) belongs to the semantic field of this sign, or not" (Oleński, 2001, p. 89). On the other hand, when the field is ambiguous, when: "... we cannot univocally judge whether within a particular system, an object (...) belongs to this semantic field or not" (Oleński, 2001, p.

89). In practice, it is hard to talk about the unambiguous-ambiguous semantic field dichotomy. We should rather talk about the level of the semantic field ambiguity, which is particularly high where the assessment of the sense is based on subjectivity, and (weak) signals are to indicate future discontinuities.

The «weak signals» concept was introduced to management by Ansoff (1975, 1980, 1985) and developed by other authors (Coffman, 1997; Nikander, 2002; Day & Schoemaker, 2005; Ilmola & Kuusi, 2006; Hiltunen, 2008). The idea of «weak signals» is related to Ansoff's conclusion that changes in the environment are signaled by earlier information transmitted exactly by means of weak signals which are their indicators. He writes about strong signals: «... Issues identified through environmental surveillance will differ in the amount of information they contain. Some issues will be sufficiently visible and concrete to permit the firm to compute their impact and to devise specific plans for response. We shall call these *strong signals issues*» (Ansoff & McDonnell, 1990, p. 20). On the other hand, he writes about weak signals: «... Another issue will contain *weak signals*, imprecise early indications about impending impactful events.(..)but it is not possible to predict with confidence where and when they will occur, nor what specific shape they will take» (Ansoff & McDonnell, 1990, p. 20). In the beginning, signals are unclear, difficult to receive and interpret, and signals are weak. They occur in various contexts and form and do not attract attention as they seem to be insignificant and incompatible with the prevailing way of thinking. Only the lapse of time makes them strong and understandable to everyone. Strong signals are easily noticeable and easy to be interpreted, and they contain clear, understandable information, that is why the assessment of their impact and capabilities or threats arising from them is easy (Gustaffson & Ahola, 2016). Ansoff attributes an anticipatory character to weak signals and talks about them as about certain forerunners, symptoms of changes (signs). What becomes crucial in the identification of the direction of changes in the environment is the use of information coming from weak signals in decision-making processes and their quickest possible transformation into strong signals (the drop of the ambiguity level of the semantic field). A weak signal, being a prospective symptom having an ambiguous semantic field is a medium of the message about the object attributes and enables the identification of possible changes in advance. The possibility of using weak signals in action is the question of the ability to decrease the level of their semantic field ambiguity. Weak signals received today may be a source of information about future changes, because constituting their symptoms which have to be made more precise and detailed in the further process. Owing to the fact that there is usually a delay between their maturing and the moment of becoming the main stream, they give great opportunities to learn, grow and develop.

Weak signals have attributes presented, among others, by Blanco, Caron-Fason & Lesca (2003). They indicate their anticipatory character, qualitative significance, they are ambiguous and fragmentary, and often dispersed. Acquired, collected and processed signals may be a source of information about potential changes, but it is necessary to make them more precise, as the actions that the organization can undertake in reaction to a change in the environment are related to the strength of the received signal. The stronger it is, the more explicit and complete the information is, and the decisions taken on its basis are more rational, at the same time such signals are commonly available and do not constitute a source of knowledge which would lead to building the competitive advantage. It is also connected with the time of their use because waiting until the information is complete and fully adequate to undertake strategic planning leads to strategic surprise, and if the accepted messages are imprecise and fragmentary, their content will be insufficient to undertake detailed planning.

For Nonaka and Takeuchi (2000), knowledge is created by the information flow when it is anchored in the beliefs and commitment of the observer. However, the condition to consider any object a signal is its semantic field which cannot be empty because it makes a sign out of which, which "... signifies an object in a given information system (...), namely contains specific information if in a given system there is now, there was in the past, or there may be in the future an event, an object, a process or their qualities belonging to the semantic field of this sign" (Oleński, 2001, p. 85).

To sum up, weak signals can be defined as signals being prospective symptoms with an ambiguous semantic field. Of course, the division of signals is not a discreet division: strong – weak. We can rather talk about a continuum of which there are signals of various strength. The higher the ambiguity of the semantic field is, the weaker the character of the signal is, the lower the ambiguity, the stronger the signal is.

4. External and internal conditionings of signaling changes in the environment

Objects in the business environment in a continuous way send signals carrying messages which can potentially supply decision-making processes with information (Dutton, Fahey & Narayanan, 1983). They play a crucial role in solving operational and strategic problems since they carry messages containing information about the occurring and potential changes. The signals, however, do not have to have a specific receiver, that is, an object sends a signal being the vehicle of a message, but it does not have to be addressed to anybody in particular (the datalogical level – everything signals something).

Decision -makers can (but do not have to) take decisions and actions with regard to their identification and interpretation (Herbig & Milewicz, 1996) (the infological perspective – we do not identify and interpret all signals).

Objects in the environment are perceived by observers and can be treated as symptoms of discontinuities, but it is necessary to differentiate among the objects themselves and the sensemaking. The weakness of signals has its external and internal sources. The external weakness results from the objectively weak connection among objects in time and space. Objects can, but not necessarily have to, be linked to other objects because, on the reception of the signal, which has the source of its weakness in the environment, it is only a symptom and should be monitored as with time more signals will appear, enabling its more correct interpretation. On the other hand, the internal weakness of the signal occurs when the organization does not notice the links occurring among objects in time and space. To a great extent, it is related to the lack of identification or their wrong identification. Therefore, the weakness of signals appears everywhere where there is an objective vagueness and ambiguity of the links of objects, but also where the links cannot be identified properly.

The problem of external and internal sources of the weakness of signals is described comprehensively by Hiltunen (Hiltunen, 2008) basing on Pierce's semiotic model of the sign. He describes the problem from the angle of the object which signals, representamen which is the form of the sign; interpretant which is an equivalent of the sense made of the signal. In this perspective, the signal is a three-dimensional construct (Figure 3), depicting the trajectory of a change in its strength in the infological perspective, which consists of signal – information and its „visibility“; issue – the number of linked objects; interpretation – the level of understanding.

„Signal“ and „issue“ are objective (datalogical) dimensions, and „interpretation“ is a subjective (infological) dimension. The above model shows the signal transformation process in three coordinated dimensions. An increase in the signal strength (an increase in the level of the semantic field unambiguity) occurs when at least one of the dimensions „increases“: the number of visible signals („signal“ dimension) or the number of objects linked to the issue („issue“ dimension), or when it becomes more obvious what the weak signal may mean („interpretation“ dimension). Within this approach, we deal with objective (datalogical) reality in the form of potential information, yet not all information is received and properly interpreted. Therefore, the subjective reality occurs in the form of active (infological) information.

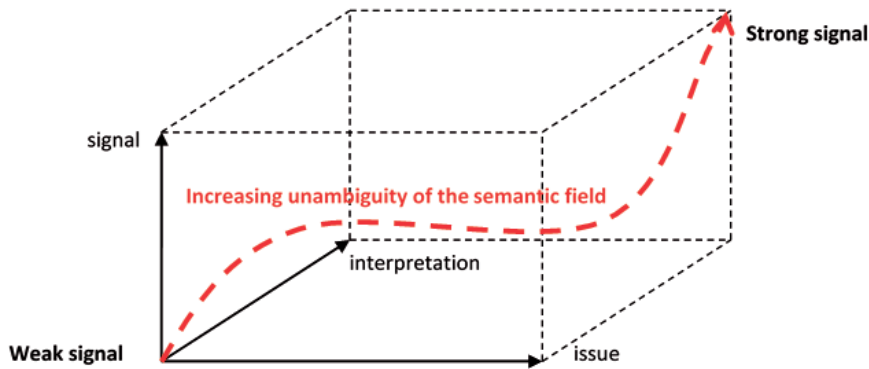


Figure 3. Three-dimensional model of signal strength

Source: Hiltunen (2008).

To sum up, it should be said that the business environment is the source of signals which communicate its changes. The signals are a vehicle of specific information which by means of interpretation are changed into a message indicating its sense for the signal receiver. Within the structuring processes and sensemaking, signals are transformed into knowledge and in this area, one should perceive their usefulness for management – they are the source of knowledge about the environment and the supply for decision-making processes. What deserves special attention are those signals which are weak, have an ambiguous semantic field, are the sign of changes, on which the prospective knowledge about changes in the environment can be built. Their analysis is difficult because they are fragmentary, ambiguous, dispersed, qualitative, incomplete and mixed with noises. Therefore, it is crucial to understand their implications for the organization, which is fulfilled by collecting other signals and information and an attempt to interpret them better. The signal strength changes and the signal which is initially weak becomes stronger with time, at the same time leading to the reduction of the selection of possible decision-making options and pushing organizations towards a crisis situation. The direction, speed and character of the transformation of weak signals into strong signals is determined by external and internal sources of weakness.

5. Conclusions

The capability of an organisation of recognising changes in the environment in the infological perspective is conditioned, among others, by such factors

time the decision-maker has from the acquisition of information to the necessity to make a decision; the knowledge resource which determines the way of interpreting the signal; the context conditioning the attention of the decision-maker and information processing; the emotional state influencing the equilibrium of datalogical (objective) and infological (subjective) perspective of decision-making; the circumstances of acquiring information, which influence the interpretation of information (Stefanowicz, 2004, pp. 20-21). It should always be ensured that information in the information and decision-making system is both objective (potential) and subjective (active). In the infological perspective, which focuses on information as the content provided by the signal, the distinction between the datalogical level and the infological level allows me to understand the meaning of both the processes of obtaining information and the processes of processing it, leading to decision-making. Organizations which want to improve the effectiveness of those processes, have to extend the scope of the observations of the environment to increase the access to potential information, and in the process of its identification rely on sources which are “rich” in information – external and personal one. On the other hand, in the interpretation process, the received potential information should be subject to as broad analysis and processing as possible, both inside and outside the organization in order to consider a plurality of cognitive perspectives, make the most adequate interpretation of it. Obviously, the process is complex and efficient systems recognising changes by means of the transformation of potential information into active one must overcome the existing barriers, both on the individual level (cognitive limitations, exploration of periphery, exploration and scope of scanning the environment), the group level (challenging the assumptions, increasing interactions between interpreters, differentiating cognitive perspectives), as well as the organisational one (building adequate information culture, systemic solutions), and the entirety boils down to equalise objective weaknesses and subjective conditionings of the process of building knowledge about changes.

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