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## **INTRODUCTION**

This paper takes an ecological perspective that views management systems and information systems as dimensions of the overall organizational platform. It views management as a process of learning. Learning is considered of critical importance in the current climate of swift changes and within the context of globalization and communication, opportunities and challenges presented by day-to-day advancements in information technologies.

The purpose of this article is to explore and reflect on the meaning and practice of management as learning, and the role of information systems in this process. The objectives of the paper are to ground the exploration in systems theory, with reference to concepts of information, knowledge, context and learning, autopoiesis, viable systems as well as to reach for insight within the complexity, i.e. the importance of interaction focus and emergence, and the cognitive sciences, i.e. the importance of awareness and reflection.

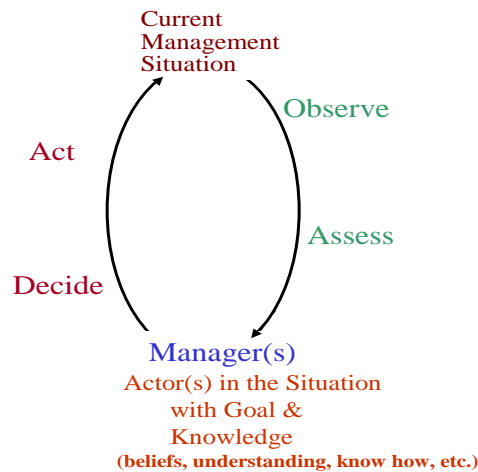
## **BACKGROUND**

The concept of learning has existed in the management literature for quite a while. However, there is a considerable gap between the terminology and the conceptual base of management literature and that of the Information Systems (IS) field. (Waring and Wainwright, 2004; Sice et al, 2008; Small et al, 2008) The authors consider that this gap is detrimental to seeing a holistic picture where Information Systems are studied as simply another dimension of the organizational platform, an added attribute that is to be thought of separately.

## **MAIN FOCUS OF THE ARTICLE**

### **MANAGEMENT AS LEARNING**

Harry (1999) defines management as 'an activity aimed at achieving something desirable often with and through other people'. This view implies there is something we wish to achieve; we make decisions about what actions to implement based on our goals and our knowledge of the current situation. This would involve a 'learning loop' between two basic entities within an organization, the manager and the situation being managed (Figure 1). After 'observing' the situation, the manager 'assesses' it and then decides what needs to be done. This, in turn, initiates actions to trigger the implementation of those decisions. Those actions change the situation, which provides feedback (the effect of the action influences the action to be taken next) into the Observe-Assess-Decide-Act learning loop. (Espejo and Schwaninger, 1993)



**Figure 1. Management as a ‘learning loop’**

The management system in Figure 1 exhibits self-regulatory behavior. This self-regulation is achieved through a control mechanism that is based on feedback (Figure 2).

Effective management requires information feedback. This interpretation constitutes Principle 1 of our reflection on management, information and information systems:

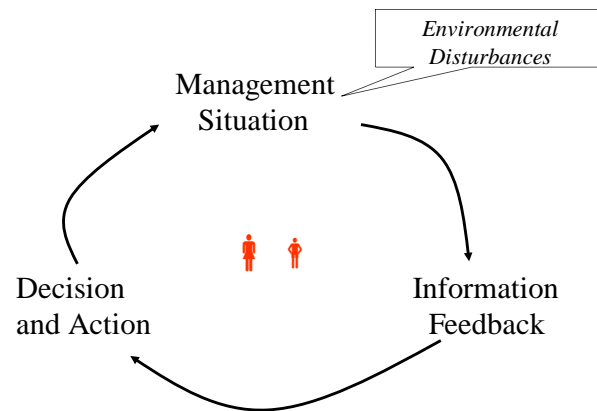
**Principle 1. Effective management depends on control (self-regulation) achieved through information feedback.**

Control is an attribute of the management control system. (Beer, 1975, 1979) The word is not used in the way in which a manager might use it. It is used to mean instruction or command; it is used as a name for connectiveness (self-regulation) (Prigogine and Nicolis, 1989). This self-regulation is based on feedback (Varela, 1979; De Gues, 1997).

In many respects, everyday human activity is a useful analogy with which we can demonstrate the activities of self-regulation. (Sice et al, 2000, 2008) We are immersed in a world perceived through our sense organs. Consider when riding a bike, you are succeeding to keep the bike on the road. This is because there is an uninterrupted circuit of information flowing through your sense organs to the cerebellum and if you observe that you are going to hit the curb, you steer away and adjust the direction of the bike.

Similarly, the process of receiving and using information in organizations is the process of adjusting to challenges that are presented by the internal ‘operations environment’ and an outside ‘market’ environment of supplies and demand. In this respect, the needs and complexity of modern production and modern markets place enormous demands on the feedback mechanisms of the enterprise. These mechanisms may seek to regulate production and market share, as well as innovation and technical

change in the enterprise itself. An organization is not a loose conflux of events but a tightly knit network of information. In addition, the effectiveness of this network is what makes control possible. (Beer, 1979)



**Figure 2. The Feedback Process (Sterman, 1994)**

The feedback loop in Figure 2 describes a process of learning. The decision makers acquire information about the state of the situation, perceive discrepancies between the desired and actual state and take actions to cause the situation to move to the desired state. When driving, we may turn the steering wheel too little to bring the car back to the centre of the lane, but as visual feedback reveals the error, we continue to turn the wheel until the car returns to the straight. (Maturana and Varela, 1987) If the current price of our product is too low to balance orders with production, depleted inventories and long delivery delays are the result. This causes us to raise the price until we discover the price the market will support. If the market remained constant, the managers would have had a relatively easy job of maintaining the right price for their products. As the market environment changes, i.e. competitors' change their policies, new products appear, etc., the management of the right price becomes a continuous learning process. (Sterman, 1994)

It is important to realize here that any desired result that has no feedback loop will not be achieved (Clemson, 1987; Keating et al, 1996) Feedback loops are one of the major elements that make organizations learn and adapt in a changing environment (Figure 2). This leads to Principle 2:

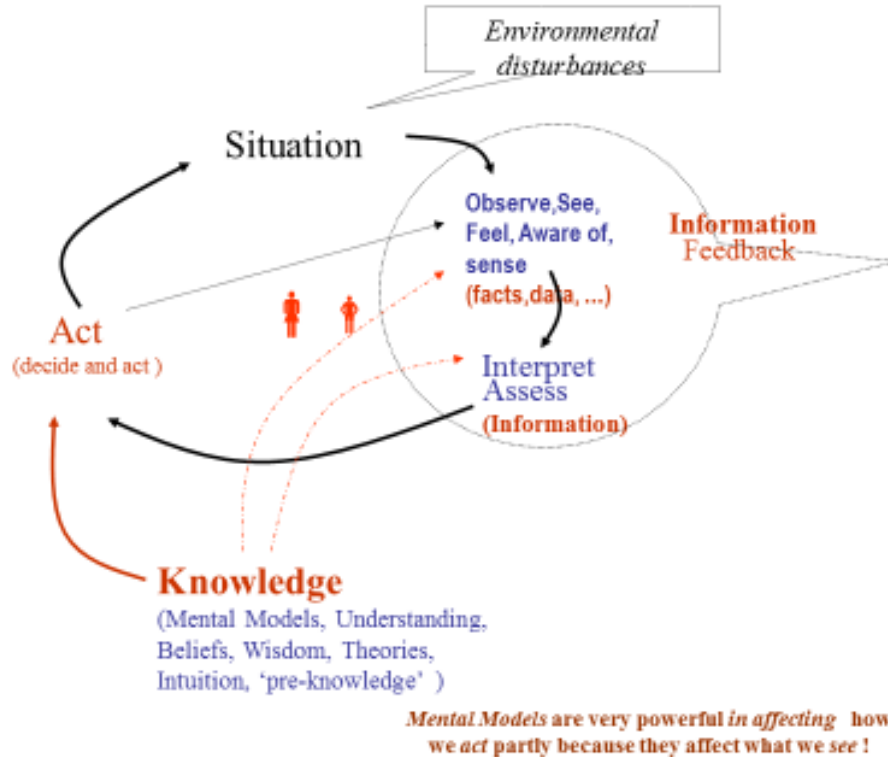
**Principle 2. Each management situation exists within a changing environment. Thus, effective management is a process of continuous learning.**

## VALIDITY OF OUR KNOWLEDGE: MENTAL MODELS AND DOUBLE-LOOP LEARNING

The feedback loop shown in Figure 2 obscures an important aspect of the learning process. Information feedback about the real world is not the only input to our decisions. Decisions are about applying a decision rule or policy to the information about the world, as we perceive it (Sterman, 1994). The policies are themselves conditioned to institutional structures, organizational strategies and cultural norms. The policies and actions are governed by the decision maker's mental models, i.e. 'pre-knowledge' of the situation (Langefors, 1995). This refutes positivistic ambitions and acknowledges that the individuals and their sense making activities are part of and not an addition to the information system of the organization. (Langefors, 1995; Bednar, 2000; Bednar & Welch, 2009). The Infological Equation, proposed by Langefors (1966), is of practical significance: *'The information I that can be obtained from some data D, depends on the data and upon the 'pre-knowledge' available to the data user and the time t allowed for the interpretation'*, that is

$$I=i(D,S,t) \tag{1}$$

As long as the mental models remain unchanged, the feedback loop in Figure 3 represents management as a single-loop learning process (Argyris, 1985), a process whereby we learn to reach our current goals in the context of our existing mental models. The term 'mental models' is used to represent our pre-knowledge of the situation, that consists of tacit understanding, beliefs and theories, assumptions and attitudes about the situation of concern (the management situation) and that leads to developing strategies, rules or policies and structures for decision and action (Figure 3).



**Figure 3 Single Loop Learning**

Single-loop learning in the management process does not result in a deep change in our mental models, i.e. of the causal structure of the system we are managing, the time horizon we consider relevant, or our goals and values. Single-loop learning does not alter our worldview.

Most people do not appreciate the impact of mental models, instead believing naively that their senses reveal the world as it is. On the contrary, our world is actively constructed, modeled by, our sensory and cognitive structures. To illustrate this point we consider the blind spot experiment (Figure 4). When conducting the experiment, one observes that by focusing his/her attention on one of two objects placed side by side, one of the objects would appear to disappear if he/she held their head at an appropriate distance from the objects (Maturana & Varela, 1987).



**Figure 4. The blind spot experiment. Close your left eye and stare at the cross. Keep the page at about 15 inches distance. By playing with the distance, you will notice that the spot disappears.**

The explanation of this phenomenon is that the image of the dot falls in the area of the retina where the optic nerve emerges; thus, it is not sensitive to light. Our visual experience is of continuous space. Unless we do these manipulations, we will not perceive the discontinuity that is always there. The fascinating thing about the experiment with the blind spot is that we do not see what we do not see.

Another well-noted observation reveals that when white light from one side and red light from the other illuminate a stick, it casts two shadows one of which appears to be red, and the other green when projected against a pink background. However, in this experiment there is explicitly no green light, only shades of red, white and pink. Thus, the perception of green in the experiment cannot be account for by a direct mapping of an ‘objective’ world (Maturana and Varela, 1987).

The implication of such observations is that the phenomenon of knowing cannot be taken as though there are ‘facts’ or objects out there that we grasp and store in our head. ‘The experience of anything out there is validated in a special way by the human structure, which makes possible the thing that arises in the description. (Maturana and Varela, 1987) In other words, how the world appears to us is inseparable from our particular way of being. Thus, in our interactions, we specify a world rather than recognize one and it is this specified world that constitutes our knowledge.

The blind spot experiment shows that our knowledge of the world is not a representation of the ‘objective world’ but a specification of a world we recognize. Both of the above experiments show that our mental models are not representations of the world; they are constructions of ‘reality’ specified by the human observer. (Maturana and Varela, 1980) The construction of ‘reality’ is equally valid at levels higher than the level of visual perception.

Consider the following example (adapted from Sterman, 1994):

*‘A large corporation worked with the Organizational Learning Centre at MIT to explore ways to reduce the total cycle time for their supply chain. At that time, the cycle time was 182 days, and they sought to reduce it by half, to 90 days. With the support of senior management, they assembled a team to address these issues. At the first meeting the team presented background information including the diagram below’(Figure 5):*

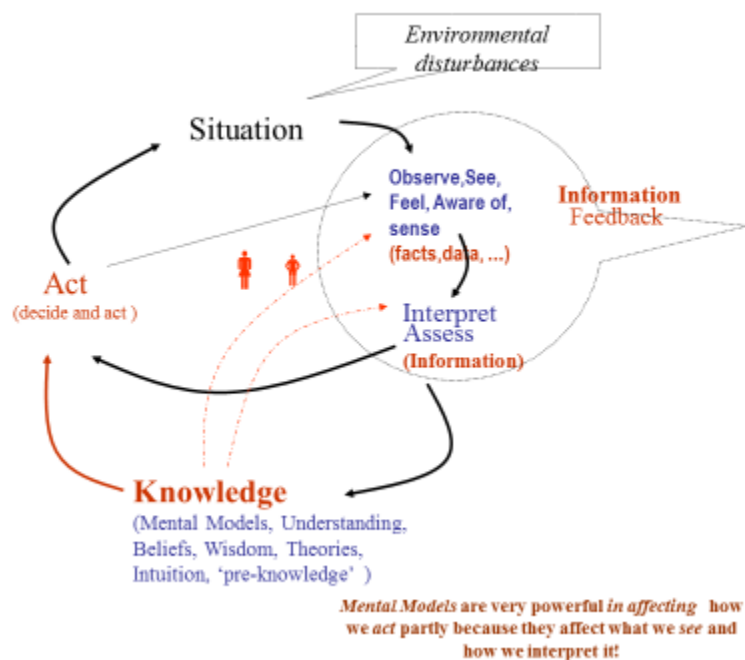
<i>Manufacturing Lead Time</i>	<i>ORDER FULFILLMENT LEAD TIME</i>	<i>Customer Acceptance Lead Time</i>
<i>75 days</i>	<i>22 days</i>	<i>85 days</i>

*182 days* →

**Figure 5. Cycle Time Interpretation - adapted from Sterman (1994).**

Figure 5 shows the current cycle time divided into three intervals along a line: manufacturing lead-time, order fulfillment lead-time and customer acceptance lead-time. Order fulfillment which then required 22 days, occupies more than half of the total length of the line, while the manufacturing lead time, then requiring 75 days (70 days due to suppliers), receives about one quarter of the length. Customer acceptance, then requiring 85 days, occupies only about one eighth of the total length. What the diagram reveals is the prominence of order fulfillment operations in the mental models of the people on the team and the insignificance in their minds of vendors and customers. It will come to no surprise to the reader that the members of the team all worked in functions contributing to order fulfillment. *'Until the consultant pointed out this distortion, the members of the group were unaware of the illusory character of their image of the supply line as we normally are of the illusory character of visual experiences.'* (Stermann, 1994)

The type of reframing stimulated by the consultant's intervention, emphasizes double-loop learning (Figure 6). Here information feedback not only alters decisions within the context of existing frames and decision rules but feeds back to alter mental models. This leads to the third principle:



**Figure 6. Double Loop Learning**

**Principle 3. Effective management is a double-loop learning process. Such learning involves creation of new knowledge about understanding the situation, and leads to new strategies, new decision rules and new organizational structures, not just new decisions.**

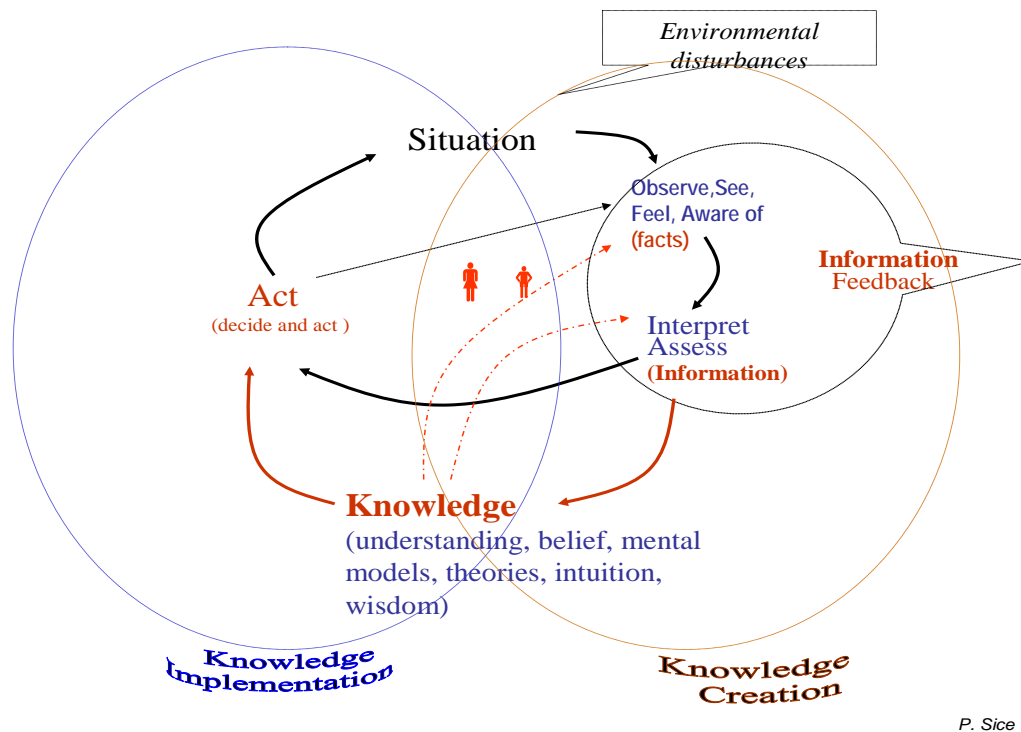
Such an interpretation requires rethinking of management practice. Managers need to view the organization as a human community capable of providing diverse meanings to information outputs. They



also need to make the organizational information base accessible to organization members. Emphasis on multiple and diverse interpretations of information helps in development of a large repertoire of responses needed for deciphering the complexity inherent in dynamic changes of the business environment. (Malhotra, 2000a). The Infological Equations (1) also suggests to the decision-maker to involve more people in the decision process to gain time and make diverse mental models and thus more pre-knowledge available (Langefors, 1995).

**Principle 4. The role of management is to facilitate the knowledge creation and knowledge implementation processes in the organization.**

It is important that managers perceive the organization as a learning system. (Whitaker, 1996) An effective design of conditions where adequate knowledge is constantly sought, renewed and implemented will enhance organizational viability (Figure 7), i.e. the ability to continuously adapt and learn. (Beer, 1979) In his interpretation of the role of Information Systems in the organization, Checkland (1998) refers to data, information and knowledge as ‘created meanings’ that lead to and determine the quality of purposeful action. He also emphasizes that effective conditions for knowledge creation and implementation are fundamental to performance. The implication is: the fragmentation, that persists in the information systems field, between information management, knowledge management and organizational theories is flawed. There is a need for a holistic perspective that brings these dimensions to inform a common concern, i.e. the concern for organizational performance.



P. Sice

**Figure 7. Management, Information and Knowledge.**

## **CAPACITY FOR LEARNING, AWARENESS AND REFLECTION**

The concepts of double-loop learning and knowledge creation have been found useful in contemplating, explaining and evaluating the role of management, information and knowledge in organizations (Argyris, 2004). However, whether the application of these concepts is beneficial for sparking creativity in organizations, depends on developing learning competence.

The capability to learn how to learn, is emphasized by Gregory Bateson, as ‘deutero learning’ (Bateson, 1972 ). It requires reassessing and questioning not just mental models of the situation, but the frameworks and capacity for learning, i.e. the context of the situation and what choices it supports or denies, as well as one’s own assumptions and constraints.

It is thus important to reflect on the process of learning and management and to enrich the discourse by recognizing and evaluating the need for developing reflective, awareness and manifesting capability at personal, team and organizational level.

The rational view of human activity of engaging with the world involves two aspects: acting (physically engaging with the world) and reflecting (mentally engaging in interpreting the world). The traditional focus of the Western approach to learning is on developing reflective capability. It is reflection on experience that can lead to insight and adequate interpretation and thus action (Sice et al, 2013). Important aspects of reflective capability are rational intelligence and emotional intelligence. Rational intelligence requires the quality of ‘open mind’, i.e. to suspend assumptions and mental models and observe to notice ‘the facts’, i.e. what is going on in a situation of concern. Humans, are always immersed in an emotional space. Bateson (1972) argues that true learning comes when thought and emotion are combined in a whole. Emotions have an important role to play in human decision making (Damasio, 2006) Acknowledging and responding rather than reacting to one’s emotions requires emotional intelligence. Cultivating rational and emotional intelligence develops a reflective capacity that allows for insight and creative interpretation.

Whilst reflection is inseparable from the process of knowing, there is another form of engaging that is equally important, i.e. the act of ‘becoming aware’ (Vyas et al., 2012). ‘Becoming aware’ is an act of examining and enhancing personal experience through cultivating the qualities of attention and intention to allow for transcending thought and emotion, operating from the space of non- judgment, observing with open mind and open heart, open curiosity, i.e. to discover as though for the first time. This leads to opening up new possibilities in our habitual mind stream. (Depraz, Varela and Vermersch 2003)

In Western translation heightened state of being aware’ is often referred to as ‘mindfulness’. This terminology is widely accepted in the West, where the state of ‘mindfulness’ is defined as an opposite to ‘mindlessness’, i.e. where we are engaging/functioning on an autopilot, downloading our mental models, assumptions and prejudices rather than witnessing present experience as it unfolds. Jon Kabat-Zinn (2003) provides an operational working definition of mindfulness as ‘The awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience moment by moment.’ It is important to clarify that our understanding of mindfulness as paying attention to experience as it unfolds is not only connected to present moment sensations but to accepting and

witnessing our present moment experience that may involve some or all aspects of experience, i.e. sensations, mental activity (thoughts, feelings, memory, intentions, beliefs, attitudes, etc.) and relational experience (connectedness to others, to our planet, to nature, etc. (Siegel, 2011)

The personal and collective ability to manifest learning into innovation is intrinsically linked to the reflective and awareness ability at individual as well as team and organizational level.

## **QUALITY OF CONVERSATIONS:THE IMPORTANCE OF DIALOGUE**

The phenomenal domain of human enterprises is realized through the network of interactions between the human actors. Such networks through the interactions of local agents are capable of spontaneous self-organization, to produce emergent orderly, evolving patterns of behaviors of the network without any prior comprehensive, system wide blueprint for the evolution of the system. The immediate local 'intentions' of the interacting agents are continually emerging in a context (Sice et al, 2008). According to Bateson (1972), it is not possible to have a total control over an interactive system of which one is a part. His perspective resonates with contemporary insights from complexity science. What the theory of complex systems tells us is, that the very nature of the multiple interacting and continuously changing relationships and constraints of the system, prevent precise prediction over longer periods of time, rendering the scientific approach of verification problematic (Sice et al, 2018; Snowden, 2002). This has important implications for management; the focus needs to shift from pursuing a desired state to maintaining attention on how organizational members interact in the 'now', and what qualities of these interactions allow for learning and creativity (Stacey, 2011). The system dynamics are determined by the pattern and nature of the actors' relationships and the response to any perturbation is determined by these very dynamics (Sice et al, 2008). Stabilizing the behavior of the network means simply repeating the past (Prigogine & Nicolis, 1989). Through operating in the complex region, the network is capable of recognizing fluctuations in the environment and generating flexible behaviors to respond to it. Tuning the network to respond to perturbations is achieved through a continuous evolution of structure, i.e. adaptation and learning. Learning is not a matter of accumulating representations of the environment. Learning occurs in a continuous process of transformation of behavior through the continuous change in the capacity of the social system to synthesize it (Sice et al, 2008).

The unity of social systems is generated through the network of conversations that language generates and which, through its closure, generates language itself. Social systems exist, for their members, in co-creating reality, where language agreements decide what is true and what is false. (Sice et al, 2013). However, whether language is exploited to promote creativity and learning or to stifle it depends very much, on how organizations and their management perceive the role of the human actor, both individually and as a collective. If language is used to promote the status-quo or, one way or other, reinforce a specific world-view, then it can lead to pathological organizational life, where the individual members are 'enslaved' to support and act in organizational processes that they have no access to change. Such organizations, deliberately or not, use language as a repressive tool to shape human experience, and because of this, the creative potential of exploring and developing human experience into alternative language and practices is lost. Gregory Bateson's framework of deutero-learning, i.e. reference to the

context of the situation and what choices it supports or denies, is of particular relevance, when considering organizational interventions.

An alternative to rigid organizational environments, is to foster an environment where one's awareness (and attentiveness), is actively developed. This, however, is not enough; in addition, there is a need for methods allowing to explore and harness the experience of the individual and evolve the linguistic domains of organizations. Quality of conversations becomes important, to encourage new linguistic distinctions based on new experiences and awareness to emerge. Practices like dialogue need to be implemented in organizational conversations. The basic requirement of dialogue is to be able to talk while suspending one's opinions, while neither suppressing them nor insisting upon them, not trying to convince but simply to understand, without having to say who is right or wrong. (Bohm, 2000)

Dialogue encourages opening up and engaging in listening with no other purpose than to hear what it is that is being said, whilst trying consciously to suspend one's assumptions and judgments. This 'meditative' listening can take conversations and collective practices to a deeper level and thus create a new frame of mind in which there is a common (or organizational) consciousness: a new kind of intelligence.

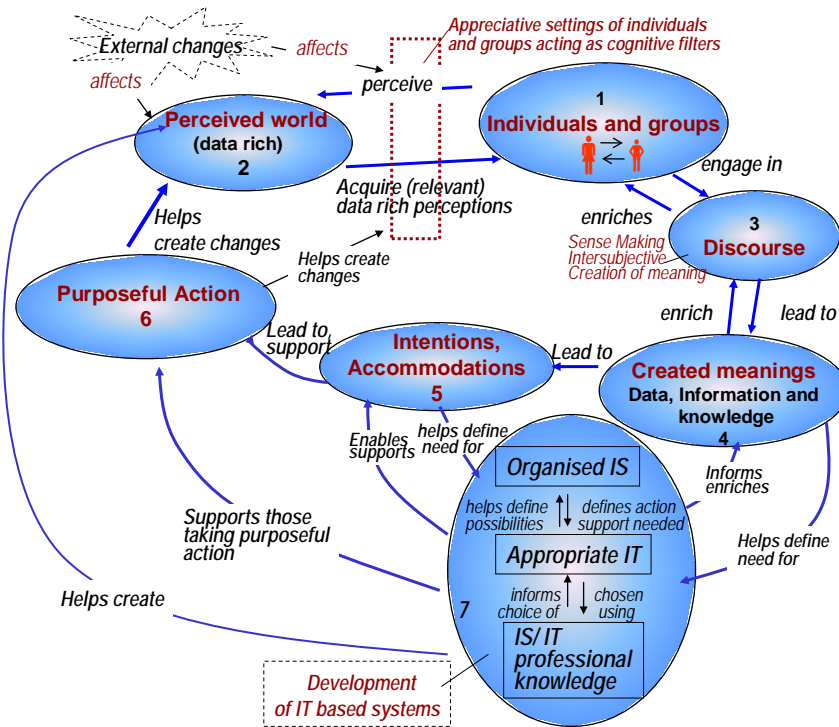
The focus on dialogue requires development of methods for engaging organizational actors in conversations that allow for co-created meanings, negotiated order and the exploration of an extended humanity. Checkland (1981), Stowell and West (1994) argue that organizational actors need to be involved in the inquiry and the exploration of actions, and that the quality of conversations in these processes is of utmost importance. Both Soft Systems Methodology (Checkland, 1981) and the Appreciative Inquiry Method (Stowell, 2013) seek to aid organizational actors in uncovering and clarifying issues of concern using tools such as 'rich pictures' and 'systems maps' to allow for a playful, less structured expression inclusive of individuals' values, attitudes and emotions. Stowell (2013) emphasizes that the Appreciative Inquiry Method has developed as a means of gaining 'appreciation' of the situation of interest with a number of participants rather than simply as a method of knowledge elicitation. Stowell and West (1994) suggest that many of the problems with conventional systems analysis methods would be alleviated by an approach that brings the user (client) as a participant in the identification and development of their information system, using 'interpretive', i.e. 'soft' systems thinking.

## **THE ROLE OF INFORMATION SYSTEMS**

Figure 8 shows a conceptual representation of the management control system. All activities within this system that are concerned with information form a subsystem of the management control system, which we will refer to as the Information System. The material realization of the information system often involves the application of information technology (Harry, 1999). However, meetings, word of mouth, storytelling, etc. are also part of the information system of organizations. The Implications of this definition of IS are: 1) Information Systems are part of the management control system and thus cannot be designed in isolation Stowell and West (1994); the purpose of IS is to improve performance (often

involving the use of Information Technology). Principle 4, interpreted with regard to the role of IS, leads to:

**Principle 5. The role of IS in management is to support, facilitate and improve the knowledge creation and knowledge implementation processes in the organization.**



**Figure 8. IS in the Organization - the POM Model. Adapted from Checkland and Holwell (1997): ‘Information, Systems and Information Systems’.**

This will require design that allows for double-loop learning, and interpretation of context (Argyris and Schon, 1978; Bateson, 1972). Argyris and Schon (1978) have argued that the massive technology of IS, quality control systems, and audits of quality control systems is designed for single-loop learning. Essentially, Argyris (1999) asserts that the problem of IS is in its reinforcement of the prevailing [rigid] structures. This in its turn is related to organizational factors: organizational structure, policy, culture, etc. Many of the recommendations to overcome the difficulties may be inadequate and, in some cases, counterproductive if they do not consider the unfrequented picture of organizational and technology factors considered as dimensions of the same business platform (Wilkinson, Charlton and Sice, 2000; Stowell and Cooray, 2017).

Argyris (1999) suggests that IS needs to be viewed as part of a more general problem of Organizational Learning. He argues that the overwhelming amount of learning done in an organization is single-loop because the "underlying program is not questioned": it is designed to identify and correct errors so that the job is done and the action remains within stated policy guidelines. Most organizations, often without realizing it, create systems of learning that suppress double-loop inquiry and active sense making, thus

making it impossible to design effective information systems (Malhotra, 2000a). A paradigm shift in the design and use of technology is needed:

‘With increasing computerization in organizations, organizational routines originally embedded in standard operating procedures and policies become embedded in the firm’s dominant logic embedded in programs and databases in the form of 'best practices'. Such formalized information systems tend to be inflexible and are often based upon designers’ belief that they have already identified the organizational and environmental properties. However, with increasingly rapid, dynamic and non-linear changes in the business environment, static assumptions embedded in such systems become vulnerable. Growing realization of such vulnerabilities is behind increasing interest in designing information systems that can take dynamic and diverse interpretations of changing information into account.’ (Malhotra, 2000b)

Institutionalization of 'best practices' by embedding them in IS might facilitate efficient handling of routine and predictable situations. However, greater proactive involvement of human imagination and creativity is needed to facilitate greater internal diversity to match the variety and complexity of the environment. The earlier emphasis of IS was in defining the optimal programmed logic and then executing that logic to achieve efficiency. Now, the increasing dynamics of the business environment require greater emphasis on ensuring doing the right thing than on doing the thing right. ‘With ongoing reassessment of key assumptions, the emphasis is more on ongoing renewal of existing knowledge, creation of new knowledge and its application in business practices.’ (Malhotra, 2000a)

## **CONCLUSION**

Information Systems are not just information repositories or message boards and they are not just communication channels. The role of IS in management is to support, facilitate and improve the knowledge creation and knowledge implementation processes in the organization. Thus, information systems need to be about the creation of conversation networks that lead to new commitments, to new ways of doing things, and to new identities (virtual selves and virtual communities). It is clear that the communication and information sharing potential of an information system is invaluable for learning and such potential should be exploited. It is also important to pay attention to interpretation, and that organizations engaged not only in maintaining the current network of conversations, but also be open and listen to the wider range of conversations that may come from outside the organization or from reinterpreting past activity with a pre-orientation to new possibilities.

The dialogue process needs to be seen as a core element within any human enterprise, as it creates the context for all activities, rather than (as may be suggested by more traditional communication approaches) being merely part of the chain of activities. Dialogue is about involvement, about co-creation, and communication. Thus, a generative dialogue process in organizations will enhance their ability to develop a meaningful language, a valid venue for action and continuous learning. Such dialogue is grounded in inquiry and reflective skills, i.e. personal and group listening, suspending assumptions and judgment and shifting the attention to the emergence of meaning within the group.

Thus, it is important that information systems be deployed with regard to the potential for double-loop learning, active sense-making activity and processes of true dialogue. Models of learning often focus on reflection, choice and action. Effective learning requires developing awareness of experience and bringing it into reflection. Thus, models of learning at the individual and the collective level need to bring into focus all four dimensions of Learning, i.e. Awareness, Reflection, Choice and Action (ARCA). The role of the information systems is to facilitate the ARCA capability of the organization.

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