

# MAKING SENSE OF ENTERPRISE ARCHITECTURES AS TOOLS OF ORGANIZATIONAL SELF-AWARENESS (OSA)

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## **Abstract**

This paper builds on the capability of EAs to define the organization's systems development environment but placing special emphasis on their power as communication tools. The concept of Organizational Self-Awareness (OSA) is offered as the contextual framework for the discussion. OSA is a process which involves, firstly, the efforts of the individual organizational member in getting to know his/her work environment, through sensemaking. Sensemaking is influenced by a number of factors, some related to the individual's psychological makeup, others related to the individual's work environment. EAs can play a relevant role in sensemaking. From activity theory the paper highlights the process of consciousness formation in human beings as well as the mediating artefacts that shape and constrain the acquisition, accumulation and development of knowledge and self-knowledge. Among the many mediating artefacts in the work environment EAs are a special type. EAs are also boundary objects due to their distinctive ability to influence perspective making and perspective taking in the process of organizational sensemaking. The paper concludes that the design and use of EAs can play a crucial role in the formation of a collective mind about the state of the organizational processes and therefore about the state of the organization.

# 1. INTRODUCTION: THE COMMUNICATIONAL NATURE OF ENTERPRISE ARCHITECTURES

In this paper, the proposition that EA can be used as an intervention method for improving the effectiveness of organizational designs and eventually for the redesign of existing organizational forms, is put forward. Much like in the most conventional and mature engineering fields, the role of enterprise modelling as an activity, is to improve the active synchronization of the organization's human and non-human agents, thus becoming the source of the explicate order which creates the implicate order that we call "organization". Off line, enterprise models are extremely useful to support reasoning, innovation, conception, design and engineering of the organization, while on line they could become instrumental in monitoring, controlling and auditing the organization's activities.

Enterprise Architectures (EA) provide integrated conceptual frameworks that enable the description of the organization from several perspectives or viewpoints. Whereas organizational models for management purposes are mainly textual descriptions, characterized by a high level of abstraction that can only be used and interpreted by humans, the IS models have achieved a greater level of detail using more formal languages, enabling the development of several IS tools based on these models. They are also extended approaches to IS implementation, although representing an evolution in relation to traditional systems design and implementation in that the systems development is founded on the business process goals and models. They are also an evolution in relation to strategic IS planning, as some of these architectures are intended to develop integrated frameworks that encompass system planning and system implementation as well as process, production and retirement activities. This integration has been accomplished by combining the Enterprise Architecture methodological framework with a software development framework, namely the Rational Unified Process - RUP (Kruchten, 2003) in the cases of Enterprise Unified Process - EUP (Ambler et al, 2005) and Integrated Architecture Framework - IAF (Goedvok et al, 1999).

Organizational modelling in the Information Systems (IS) field emerged approximately 20 years ago (Sousa, 2006) from the widely acknowledged need of designing and implementing IS to support the business. After nearly a decade of neglect, large organizations are suddenly becoming interested once again in modelling organizations at the highest level. This "revival" is most commonly referred to as enterprise architecture (EA) (Orr, 2003). EA are also tools made of language (textual and diagrammatic) which mediates between organizational members and their organization. Therefore, EA are also important communication tools which can be instrumental in forming the awareness of organizational members about their organization. They have been used for promoting data sharing, thus reducing data redundancy and reducing maintenance costs; for component development, management and reuse; to reduce software development cycle time; to enable strategic information to be derived from operational data; to facilitate change management (North et al, 2004).

Building on the capability of EA to define the organization's systems development environment through guidelines and standards, but building especially on its communication power, new questions can be formulated, such as:

*Given the way that EA makes work and information flows visible, how does such explicitation affect individual and collective understanding of the organization's state of affairs? How might EA be used to influence the level or the quality of sensemaking in the organization? If EAs are rightfully considered as boundary spanning objects, how does their design and use affect the stability of organizational processes? How can EAs be used as catalysts of change in organizational design?*

In the sections below we hope begin finding answers to these and we will do so from the point of view of the organizational sciences. Our intention is to establish a foundation from which our investigation into various aspects of organizational design and engineering (ODE) can profit from. ODE is a multidisciplinary research project born at the Department of Computer Engineering of the Instituto

Superior Técnico in Lisbon, Portugal and now established at the Centre for Organizational Engineering of INESC. ODE takes a realist and emergent stance on organization, reaffirming it as a socio-technical phenomenon which self-realizes in the actions and interactions of its component parts.

## **2. A DYNAMIC VIEW OF ENTERPRISE ARCHITECTURE AS PART OF ORGANIZATIONAL SOCIAL ACTION**

Our perspective on EA is based on a view of organization as a socio-technical entity which self-realizes in the permanent action and interaction of its component parts. This view of organization is the outcome of a number of intellectual influences, namely organizational constructionism (Giddens, 1984) and autopoiesis (Maturana and Varela, 1980; 1987), to mention only the most important. In this paper we focus on the organization as the resultant of the actions of individual persons or social actors. We concur with the view that the “socially thin” user construct that most of IS research utilizes, limits our understanding of information, manipulation, communication and exchange within complex social contexts (Lamb and Kling, 2003)

Structure is another important notion originating from social theory (Giddens, 1984). Structures are sets of rules and resources recursively organized as properties of social systems. Rules are procedures of action, aspects of praxis. Rules are generalizable procedures applied in the enactment or reproduction of social practices. Resources are structured properties of social systems, drawn upon and reproduced by knowledgeable agents in the course of interaction. Resources are the media through which power is exercised. Structure is saved as memory traces and is recursively implicated in social systems. Social systems comprise the situated activities of human agents, reproduced across time and space. The notions of agency and structure are the cornerstones of Giddens’s (1984) structuration theory. It aims to reconceptualize the dualism between human agency and social structure and suggest a recurrent duality between agency and structure. For Giddens, social action makes up what he calls the *system*, that is, the observable patterns of events and behaviour; the other part of the duality – the *structure* – comprises the unobservable rules and resources used to generate the system. Structuration is thus the process of producing and reproducing social structures (i.e. reality) through the daily activity of social actors. When interacting, people draw on unobservable resources which can be of three types - signification, domination and legitimation. Signification resources are used in order to allow the formation of meaning during an interaction. Domination resources are deployed in order to bring power into the interaction and to influence its outcome. Legitimation resources are brought into play in order to bring in authority, to command and to sanction. All three elements of structure are present in communication in a totally intertwined manner.

A social actor is “an organizational entity whose interactions are simultaneously enabled and constrained by the socio-technical affiliations and environments of the firm, its members and its industry” (Lamb and Kling, 2003: 218). The information systems literature begins to incorporate large amounts of fundamental research on social theory which has important implications on the way that enterprise architecture (EA) is understood, now and in the future. Social actors use computers, information products and other information systems in their interorganizational and interpersonal relations. These artefacts shape who they are, as organizational members and what they can do in terms of their interactions with other organizational members. However, because as social actors, organizational members are not primarily users of such artefacts, often they have limited discretion in the choice or use of IS (or EA).

The user concept reflected in much information systems research reflects users as atomic individuals with well-articulated preferences and the ability to exercise well-informed choice over the use of IT artefacts. Field studies show, however, that user studies often do not accurately predict IT use outside laboratory contexts and also that such studies simply do not scale up to organizational or industry level (Lamb and Kling, 2003). Human action is not a mere combination of acts. Action can not be discussed in separation from the body, its mediations with the surrounding world and the coherence of an acting self. Studies of IT use must, therefore, taken into consideration the context of such use.

### **3. SENSEMAKING AND ORGANIZATIONAL DESIGN AS THE BASES OF ORGANIZATIONAL SELF-AWARENESS**

Structuration theory can be refined further in search of the intellectual foundations for a new construct that we have labelled *organizational self-awareness* (Tribolet, 2005). Such a refinement can be found in the teachings of Weick (1995) about the social construction of organization and especially about the concept of sensemaking, a key cognitive mechanism for the social construction of reality. Sensemaking is about “the enlargement of small cues”. It is about the “search for contexts within which small details fit together and make sense”. It concerns “a continuous alternation between particulars and explanations, with each cycle giving added form and substance to the other”. Finally, it is about “building confidence as the particulars begin to cohere and as the explanations allow increasingly accurate deductions” (1995:133). In the following definition of organization Weick highlights two layers of sensemaking which correspond to two layers of organizational activity: the intersubjective and the generic subjective.

[Organizations are] social structures that combine to the generic subjectivity of interlocking routines, the intersubjectivity of mutually reinforcing interpretations, and the movement back and forth between these two forms by means of continuous communications. (1995:170)

The first level - intersubjective meaning - happens when at least two persons communicate their thoughts, feelings or intentions, moving the interaction from the “I” state to the “we” state. The intersubjective level is the level where “social reality” begins to emerge. The next level is the generic subjectivity level, which corresponds to social systems where interacting human beings are no longer present as they have been replaced by roles or identities. “Social structure implies a generic self, an interchangeable part - as filler of roles and follower of rules - but not concrete individualized selves” (Wiley, quoted in Weick, 1995:71).

Frequent interpersonal communication about work reinforces shared meanings (by “mutually reinforcing interpretations”), making participants more mutually dependent and their activities more mutually predictable, thus increasing both intersubjectivity and generic subjectivity. According to Weick, organizations are adaptive social forms “animated by movement and communication”. As intersubjective forms they create, preserve and implement the innovations that continually arise from personal interactions. As forms of generic subjectivity, they exert control over the energies generated by such innovations. Hence, there is a tension between the two forms of subjectivity inherent in the attempt to reconcile the innovation afforded by intersubjectivity with the control exerted by generic subjectivity.

Sensemaking, defined as structuring unknown contexts and/or actions and assigning them with meaning, is distinguished from other explanatory processes such as understanding, interpreting or attribution, by seven characteristics: (1) Grounded on identity construction, (2) Retrospective; (3) Enactive; (4) Social; (5) Ongoing; (6) Focused on and by extracted cues; (7) Driven by plausibility rather than accuracy. These seven properties affect the initial sense that a person develops of a situation and strongly influences the way that the person will update and develop their perception of the situation, for future action. In other words, sensemaking lies at the foundation of a consciousness or awareness that organizational actors develop of the organization as a whole and of their place in it. According to Weick (2001), the seven properties are also affected by organizational designs. Some organizational conditions seem to hinder sensemaking while others seem to enhance it. This is where the use of EA as an implementation tool comes in. If we are able to represent organizational conditions through EA and link sensemaking outcomes to the architectural representation of the organization, we would succeed in improving sensemaking on the drawing board, so to speak. This would not only be a factor of information systems development and implementation, but would involve design issues involving the organization as a whole.

A word of clarification about organizational design is needed given the temptation often associated with the architecture metaphor, to consider design as a static process occupying a well defined point in

time. We concur with Weick (2001) when that author says that the expression organizational design contains a trap. The semantic trap has to do with the fact that the word *design* can be used either as a noun or as a verb. Often, *design* is taken to mean things like organizational charts, written procedures or job descriptions and the more dynamic connotation of design is neglected. Quoting Starbuck and Nystrom (1981), Weick (2001: 60) argues that a “well designed organization is not a stable solution to achieve but a developmental process to keep alive”. A design should not be considered as a blueprint but a recipe; it should produce order through attention; and it should be able to codify unplanned change after the fact.

#### **4. ENTERPRISE ARQUITECTURE AS BOUNDARY SPANNING ARTIFACTS SHAPING ORGANIZATIONAL AWARENESS**

Activity theory incorporates strong notions of intentionality, history, mediation, collaboration and development in constructing consciousness (Nardi, 1996). Although not originally conceived as a social theory, it is consistent with many of the notions of Giddens's (1984) theory of structuration and Maturana's (1988) notion of the formation of social networks. Activity theorists argue that consciousness is not a set of discrete disembodied cognitive acts (decision making, classification, remembering), and certainly it is not the brain. Rather, consciousness is located in everyday practice, i.e. you are what you do. And what you do is firmly and inextricably embedded in the social network of which every person is an organic part. This network is composed of people and artifacts. Artifacts may be physical tools or sign systems such as an EA.

A key principle of activity theory is tool *mediation*. Tools shape the way human beings interact with reality. Tools also reflect the experience of other people who encountered and solved similar problems and invented or modified a tool to make it effective and efficient. The use of tools constitutes an accumulation and transmission of social knowledge, influencing the nature not only of external behaviour but also of internal mental functioning (Vygotsky, 1978). Technical tools manipulate physical objects (e.g., a hammer) while psychological tools are used to influence other people or oneself (e.g. a calendar or an advertisement).

For activity theory then, what it means to have a human consciousness is to be a part of a web of social activities and to live and act in a culturally elaborated environment that is profoundly artificial, populated by a wealth of tools, including language (Nardi, 1996). Vygotsky's definition of consciousness emphasizes the active processes of the higher and lower psychological functions. Lower functions are basic capabilities such as attention, will or intention. The higher functions include language, decision making, abstraction, generalization, classification or problem solving. Because these functions arise, develop and change within a social network, they cannot be seen as residing strictly "under the skull", i.e. consciousness is a social phenomenon, simultaneously beyond and within the individual. This is in line with Giddens' theory of structuration which assumes that human action is restricted by institutional properties of social systems while, on the other hand, these institutional properties are the product of human action.

According to the knowledge-based view of strategy, the ability of the firm to integrate and combine various sources of expertise is a crucial source of competitive advantage. Such integration, however, encounters a variety of obstacles associated with the embeddedness and tacitness of knowledge (Levina and Vaast, 2005). Boundary spanning objects have been suggested as loci of accumulation of knowledge sitting at the junction between various group-specific memories as well as coordinating such memories in organizations (Cacciatori, 2006). They refer to a wide range of artifacts that “are plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites” (Star, 1989: 393). Boundary spanning objects range from prototypes to architectural drawings or to computer-based information systems.

Effective boundary objects are those which are not only tangible, accessible and up-to-date (Carlile, 1997, 2000; Bechky, 2003), but also accepted and used. Levina and Vaast (2005) make a useful

distinction between nominated or designated agents or objects and boundary spanning-in-practice. Those authors refer to boundary objects-in-use as those artefacts that with or without designation, are incorporated into the practice of diverse groups in the organization, acquiring a common identity in joint practices. They mediate the changing relationships between the groups or communities involved by affecting perspective making and perspective taking capabilities (see Figure 1). “Making a strong perspective and having the capacity to take another perspective into account are the means by which more complexified knowledge and improved possibilities for product or process innovation are achieved” (Boland and Tenkasi, 1995: 369).

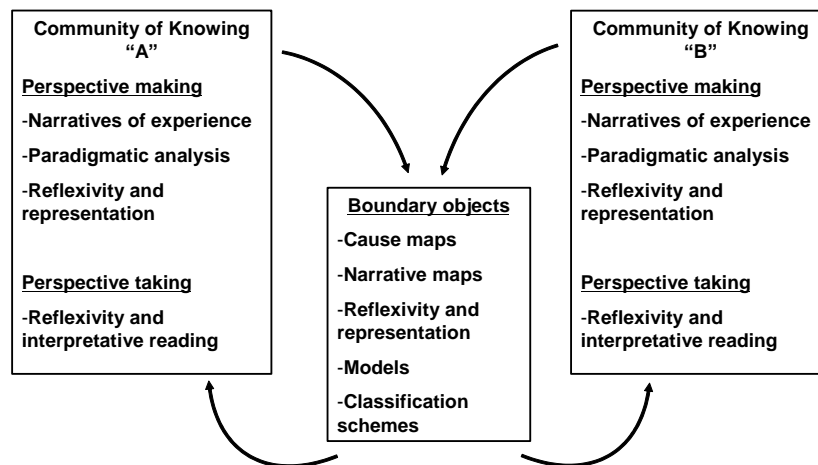


Figure 1. Perspective Making and Perspective Taking (Boland and Tenkasi, 1995)

Cacciatori (2006) argues that our concept of boundary objects has emphasised too much their collaborative dimension at the expense of their role in organizational conflict. This is due to the fact that such artefacts provide a point of entry for the control of knowledge accumulation on the part of the contributing groups. Their evolution is influenced by the need to solve concrete problems on one hand but on the other hand it is also the result of the balance of power among the communities. If both dimensions are taken into consideration, boundary artifacts can be usefully explored as memory objects structuring the process through which access and control over knowledge is regulated. Through an understanding of the dynamic co-evolution of the boundary artefact and the organizational processes it supports, knowledge integration (and hence OSA) can be better understood. Also, this will give us important insights regarding the design of boundary spanning artefacts.

Our thesis is that the formation of OSA can be significantly influenced by the presence of an architectural plan of the organization. On this point Weick (1995:75) provides the following powerful insight:

A basic focus of organizing is the question, “how does action become coordinated in the world of multiple realities?” One answer to this question lies in a social form that generates vivid, unique, intersubjective understandings that can be picked up and enlarged by people who did not participate in the original construction. There is always some loss of understanding when the intersubjective is translated into the generic. The function of organizational forms is to manage this loss by keeping it small and allowing it to be renegotiated.

If one considers EA not only as a representation of the organization but also as a boundary object spanning the structure, the processes, the procedures and the monitoring of work (i.e. a guide to organizational form), it can have a very significant impact on the formation of the awareness of organizational members, at all levels. It will be able to generate not only “vivid, and unique

intersubjective understandings” but it will also reinforce such an awareness when it is translated to the generic, that is the broader organizational level.

## 5. CONCLUSION

Summing up, we talk of *organizational self-awareness* (OSA) as the objective of our proposal for a new conceptual framework for an enterprise architecture. Such an objective has many implications. One implication concerns our own understanding of OSA. In this paper we have put forward a view based on the formation of OSA as a being simultaneously an individual and a group based phenomenon, firmly anchored on action taking place around mediating artefacts which serve as boundary spanning objects. The second implication has to do with new forms of support to communication, information exchange and work monitoring activities, leading to enhanced design, that is, to enhanced conditions for organizational agents to interact and make sense of their environments. The last implication points to the very specific need of the architectural framework itself, i.e. the need for capturing the static and dynamic aspects of the interactions of the organization’s agents with the organization’s activities and resources and enabling the construction of models exhibiting non-deterministic interaction patterns.

Regarding the first implication, we can draw the following conclusions regarding EA and its role in the formation of OSA: organizational self-awareness is a complex process which involves, first of all, the efforts of the individual organizational member in getting to know his/her work environment. This is done through individual sensemaking where EA can play a role. Sensemaking is influenced by a number of factors, some related to the individual’s psychological makeup, others related to the individual’s work environment. Activity theory tells us that the environment is crucial in the process of consciousness formation in human beings, with activity itself being the primary factor in such a process. Consciousness formation depends also on secondary factors that shape and constrain activity. From these factors we highlight the mediating artefacts, that is, the artificial elements that shape and constrain the acquisition, accumulation and development of knowledge and self-knowledge. Among the many mediating artefacts in the work environment EAs are a special type. EAs are also boundary objects due to their distinctive capability to influence perspective making and perspective taking in the process of organizational sensemaking. Thus, it may be concluded that the design and use of EAs can play an important role in the formation of a collective mind about the state of the organizational processes and therefore about the state of the organization.

The second and third implications are not addressed in this paper. The role of EAs in enhancing organizational self-awareness through new forms of communication, information exchange and work monitoring, as well as the need for capturing the static and dynamic aspects of EA are currently being researched and will be addressed in forthcoming papers.

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