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• Freyung 6/6 • A-1010 Vienna • Austria •

• Phone: +43-1-5336112 •

• mailto:sec@ofai.at •

• http://www.ofai.at/ •

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Towards the Development of a Conceptual Framework for an Applied Theory of Problem Structuring for Complex Agents: Questions to Luhmann's Social System Theory

Karl Neumayer[1] and Paolo Petta[2]

[1] *KOGNOS Consulting GmbH, Gentzgasse 123/18, A-1180 Vienna, Austria, EU Neumayer@KOGNOS.at*

[2] *Austrian Research Institute for Artificial Intelligence, Freyung 6/6, A-1010 Vienna, Austria, EU; Paolo.Petta@ofai.at*

Abstract: *This extended abstract provides a snapshot of the current status of our efforts aimed at the development of a principled approach to corporate strategy consulting. This research is motivated by the need to improve the quality of strategic decision making of enterprises as complex agents. To this end, we take a step back and propose a paradigmatic reconceptualisation of the foundations of decision making in terms of processes underlying Problem Structuring, with implications in particular for the identity of complex agents, the notion of rationality, as well as the shaping of decision processes. The two interrelated main components are the transpersonal Weinhaus conceptual modelling framework and a structured method for the development, implementation, and verification of sound interventions. A key guideline is our aim to enable the identification of relevant, practical, and verifiable interventions. Against this body of work, we can formulate a number of candidate questions to Social Systems Theory to discuss at the Symposium, so as to: critically review our achievements and ascertain the scope of applicability of our model, identify directions and means of improvements, look for answers to open challenges, and understand the potential for a reformulation in Social Systems Theory terms.*

Keywords: corporate strategy consulting, enterprise modelling, transpersonal modelling, action theory, theory of social systems, reflected behaviour

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1. Motivation

The complexity of the activities of enterprises has been steadily increasing, in reaction to an ever faster pace of change within and of the economic landscape at local and global levels that they themselves contribute to. Today, it is no longer sufficient to pursue immutable interests in a static field of activity through optimization of performance along utility criteria established in a once-and-for-all and standardized one-size-fits-all manner by external consulting and rating agencies. In real life, the increased dynamics of the environments of enterprises is already reflected in ubiquitous processes of quality management and change management: We propose that the next challenge is to move from a view of punctate "re-invention" towards more fully embracing (re-)configuring as important ongoing activity, i.e. to manage a process of *continuous* adaptation to multiple and interacting spheres of influence. The replacement (or phasing out) of the entrepreneur after a setting-up phase of the firm needs to be supplanted by capabilities of reconfiguration within the firm itself. The resulting questions to management theory are to model what such modern organizations do and are to do; what is particular about the challenges they face; and how this domain and its processes can be grasped in a structured manner. Next to an analysis of such dynamics, our requirement is to be able to derive and implement principled *interventions* suitable to bring about measurable performance effects.

We see as a main cause for the limited explanatory potential of today's decision theoretic approaches (cf. Luhmann 2000, p.7ff) that they set out from an undifferentiated and overly simplified concept of Agent (cf. Chiles et al. 2010, Mathews 2010), that in particular reflects an

overly narrow definition of its environment/field of activity. Our proposal is therefore rooted in a shift of perspective towards a trans-individual systemic view that sees and analyses agents as aggregates of environmental elements/resources. Our effort on the framework has so far been developed from a mainly action theoretic perspective: Section 2 provides a short sketch of the *Weinhaus Model*, in terms of key notions and concepts, including a description of the skeleton of the consulting process employing it. Section 3 summarises some key implications. Against this background, in Section 4 we provide early results of a first inspection of the model from a Luhmann-based perspective, and point out derived candidates for discussion points and questions for the Symposium.

Our present aim is to develop an efficient tool for the strategic orientation of enterprises. Our immediate goal is not the development of simulations but rather to enable a more encompassing *and* more specific understanding of the realities of a given enterprise client. Our main target of analysis is not the routinised *acting* of the *firm*, but rather the reflected *behaviour* of the *enterprise*. A first contribution to this task is the development of a principled and pragmatic framework that is to subserve a coherent methodology for corporate strategy consulting. We have based our approach on a notion of problem structuring that extends the scope of traditional approaches to decision theory by including explicitly conditions hitherto considered as exogenous. In particular, we promote consideration of the embeddings of companies, i.e. their concurrent memberships in *multiple* cultural *and* social contexts. Within the materialisation of the *entrepreneurial will* constituting the company, these multiple *identities* interact in defining premises for decision processes, replacing the traditional given of *static problem framings* by a continuous process of *problem structuring*. This has pervasive consequences on all dimensions of decision-making and shifts the focus from the analysis of (meaningless) *acting* of a firm to the analysis of the (meaningful) *behaving* of the enterprise, exposing components and influences suitable for the formulation, implementation, and verification of effective consulting interventions. While our focus lies clearly on the latter *practical* value, we do hope to be also able to provide small contributions and impulses for research directions in organisation and management theory. Having reached a status of first preliminary closure in model development, the present venue offers a welcome occasion to now review the achievements from the angle of social systems theory, as a validation exercise, to identify opportunities for further improvement of our theoretical basis.

2. The Weinhaus Conceptual Framework

2.1. Enterprise strategy

We characterise enterprise strategy as follows: 1) The purpose of enterprise strategy is to verify and revisit an explicit statement of the *entrepreneurial will*, from which fundamental criteria of *relevance* for all its activities are derived (e.g., a notion of *competitiveness*): the process of enterprise strategy produces and is itself based on guiding principles and rules; 2) Enterprise strategy is a *continuous process*, not a one-shot effort, providing the *pragmatic frame of reference* (not the actual definition and implementation) for all activities of the enterprise, in particular the formulation of problems. 3) Enterprise strategy has *comprehensive scope* (not just a compilation of individual activities, e.g. organisation of accounting) and provides explicit documentation of the reasons for exclusion of any potential areas of activity.

The enterprise strategy process provides the frame of orientation describing the enterprise *with* its environment. As the basis for the detection of *differences* from the ideals currently upheld, it enables the *formulation* of problems and the planning of solution approaches at all levels and for all areas, internal and external. Strategy is foremost a process of self-discovery. To provide fundamental orientation in the definition and maintenance of the *strategic horizon* of an enterprise according to this encompassing notion of strategy, we are developing a method based on the notion of *Strategic Balance*™[1]. The strategy process itself is situated in the world of corporations

[1] (Karl Neumayer, KOGNOS).

and corporate activity. The Weinhaus Model is our categorical framework to describe this domain: It provides the theoretical and conceptual underpinning for the modelling of the strategic dimension of decision and action of enterprises as *Complex Agents*, introduced next.

2.2. A Typology of Agents by Complexity

To categorise real Agents behaviourally, we propose a typology by increasing strategic complexity and autonomy (cf. also Goldspink and Kay 2007) comprising *trivial*; *reflexive*; and *self-reflexive* (complex) agents.

Trivial Agents (Type 1: "*Do it this way!*") behave on the basis of an immutable practical algorithm. Relying heavily on external information, their decision horizon is limited to the present. Their behaviour is fully and directly determined by exogenous causes; the decision behaviour of this agent type can be modelled and predicted completely by an observer as based on a fixed set of instructions. Trivial agents are highly specialised to a particular instance of (typically: operational) field activity. (We will give examples from the financial world, here: A financial trade platform executing transaction of securities)

Reflexive Agents (Type 2: "*Do it the best you can!*") are based on the executive computation of outputs (actions) and interpretation of inputs (perception). Their non-trivial behaviour results from procedures of formation and checking of *theories*. Decision making comprises algorithms and *heuristics* and occurs under consideration of *risks*; an observer can predict behaviour in a probabilistic manner only. The characteristic limitation of type 2 Agents is the invariability of their interests: they pursue optimisation of their performance for a given immutable utility function; hypothetical world models are used to manage different counterfactual scenarios. Type 2 Agents are capable of tactical behaviour; they cover a large class of real-world enterprises. (A trader, deciding based on risk assessments within a given domain)

Self-reflexive Agents (Type 3: "*Decide what you would want to do next!*") are capable of developing higher level strategies and adapting their multi-faceted behaviour reflecting *multiple evolving world views*: A Type 3 Agent can see one and the same peer as ally and as foe at the same time. To capture the level of reflection Type 3 Agents are capable of, we take each of such Agents' multiple *identity systems* (IS) to be made up of an evolving consistent *internal model* (IM) supporting a particular *world view* (a coupling to an associated slice of the agent's overall societal environment). A particular configuration of an IS at a given moment is an *identity version* (IV). A key aspect is the *trans-individual scope* of a self-reflexive agent's world modelling (cf. Bateson 1972): The utility function underlying the evolution of a specific IM need not reflect only (nor even: mainly) basic concerns of the agent itself but can focus on the interests of other agents; of shared interests of agent groups; or even on perceived properties and characteristics of the environment other than the agent population (cf. e.g. environmentalists). The process of *adoption* and *development* of ISs is embedded in the agent's *society*, and in turn supports the differentiation of societies in terms of constituting *Culture Systems (CS)* and *Social Systems (SS)*. (E.g., an investment banker)

2.3. *Identities* as Transpersonal Patterns

We analyse Self-reflexive Agents' overall activity in terms of causal contributions (influences) of the hypothetical constituting ISs and their direct and indirect interactions at the levels of acting, behaving, and modelling. The challenge for Self-reflexive Agents is to coordinate these interactions between ISs through the development of explicit conceptual internal models (IMs) for these ISs. IMs are employed and adapted to improve the Agents' overall fitness in terms of e.g. providing effective capabilities to modify *other* entities (agents and other components of the world) or enhancing reliability as resulting from consistency and predictability of its own acting. While this adaptation cannot be captured completely by the agent itself, each IM includes a "degree of satisfaction" of the modelled IS, updated according to sensed conditions. Thereby, effects of the interactions between ISs are captured and considered in an explicit manner (if still incompletely).

Note that changes to an internal model may not only be (mal)adaptive for the IS itself, but also be maladaptive for the Agent's overall performance.

The identities of Person cause Agent's overall characteristic pattern of decision making, driven by the current specific deficiencies of each of the IS of the dimension of Self. This pattern, i.e., Agent's personality, is the result of the interplay of multiple identity blueprints

2.4. *Person* as Arena of Decision Making

In complex Agents, decision making within the multiple IMs occurs considering also what is locally known of the agent's overall distributed IM landscape. *Person* is the integrating arena comprising all instances of IMs of an agent. In the decision activity of Person as strategic construction process, the dimensions of the IMs are continuously updated. The overall decision *competence* of Agent at the level of Person is the result of the interplay of the active *interests* (cf. Köhler, forthcoming) and the *intelligence bases* of the available IMs. This decision behaviour is influenced by the constitutional organisation of Person that comprises *coordination media* (Ciancarini et al. 2000) working at an objective level: all infrastructural givens that exert influence on the coordination among IMs, i.e., an agent's identity dynamics in decision making. We use the notion of *Personality* of Agent to refer to the characteristic qualities of Agent's observable individual strategic decision making behaviour, which covers both, recurrent coherent behaviour as well as typical *manifestation patterns of deficiencies*. It captures the characteristic patterns of conflict dynamics that occur between competing Internal Models in the context of the Agent's societal embedding.

2.5. *Culture Systems as Autopoietic Constituting Contexts*

The transpersonal notion of IS allows to differentiate between physical structure (Agents and environmental artefacts) and behavioural structure (interactions of ISs located in different or even one and the same Agent(s)). From a global point of view, Agents are embedded in networks of practices in which *organisational closure* achieved by *autocatalytic processes* leads to informational differentiation of webs of particular identities (Brooks & Wiley, 1988; Juarrero 1999). From their subjective local point of view, complex Agents interact with their environments in pursuit of their existential self-interests based on their specific IVs (reflected by ISs) and related problem structuring utilities. From the point of view of an observer, this is reflected in identifiable patterns of interaction between IS. We refer to the totality of these patterns as *Culture Systems* (CS). In proper systems (cf. e.g., Juarrero 1999, p.109f) the properties of the components depend on the systemic context in which the components are located. In our model, CSs provide such an essential and transpersonal context for Agents within which "integration into an orderly whole that functions as an 'organic' unity" (Rescher 1979, p.4, cited in ibid.) occurs. ISs participate in the autopoietic existence of a CS, serving as funnels across which the CS can exert allopoietic influence on an Agent. However, an IS is not a "designed" element tailored and committed to any specific CS. Driven by its subjective interests, an IS may disengage from a CS and join another, or contribute to the formation of a new CS: CSs are facultative systems: they are reversible and may disband. A CS comprises the participating ISs and physical and mental artefacts. Through the impact on the degree of satisfaction of the individual ISs, CSs acquire subjective meanings for participating Agents. To establish and sustain CS, shared norms and routines, and formalised interaction policies (with e.g. related sustaining enforcing agencies) emerge or are adopted from other already existing CS. We refer to these bodies of dependable procedures, promoted by CS and in turn contributing to the resilience of CS as *Social Systems* (SSs) (cf. Eigen & Schuster, 1979).

Even though this concept of CS originally is a modelling artefact, belonging to and attributed by an observer, CSs do effectively shape the reality of Type 3 Agents, as they frame their problem structuring processes and form the *contrast spaces* from which a course of action is then selected, taking into account the conditions set by the mechanisms of the supporting SS (cf. Juarrero 1999, pp.181ff). Enterprise Agents in particular should carry out these interpretation processes in a systematic way, so as to improve the functional balance across their selective participation in multiple CSs. We see a key challenge for strategy consulting to provide effective support in this

process of overarching constructive reflection. As a first step in this direction, we have identified an initial collection of characteristic dimensions of CS.

2.6. Principles/Skeleton of the Consulting and Intervention Methodology

In our consulting approach, we derive a *hypothetical model* of an enterprise's *real* internal organisation, setting out from the assessment of its basic Type and personality as reflected in the enterprise's activity, as well as from information about its formal organisation, field of activity, and further background information. Development of this representation is constrained and informed by the conceptual building blocks of the Weinhaus Model and their formal interdependencies, but also by the "constructivist potency" of the observing consulter. While model remains necessarily incomplete; its incremental iterative development includes both, positive and negative stopping conditions related to the activities of information acquisition; model refinement; connecting to operative management processes; setting up and initiating the intervention; and verification of intervention outcomes of implemented interventions.

Employed methods include more passive observation and information collection as well as more active probing; which in their totality make up the principled systemic consulting and intervening service provided. It is in this way that we aim to support the second order learning capability that distinguishes Agents of Type 3, while for simpler Agent Types the constructed model serves as internal reference for the derivation of verifiable interventions of simpler kinds: The straightforward structure of trivial agents affords direct authoritarian *instruction* as a particularly focused kind of consulting activity that progresses from the detection of key personality characteristics of the client to the identification of relevant internal models; these can then be connected directly to the related part of the agent's rule set, with respect to which the instructions can be finally articulated in a clear-cut manner (cf. e.g. contingency theory approaches in organisational theory, Lawrence & Lorsch 1967). Type 2 Agents capable of tactical behaviour cover a large class of real-world enterprises, who thus *depend* on external intervention for updates of IMs. This setting affords expert consulting as a particularly relevant activity. Finally, Type 3 Agents are able to *participate* in the process of reflection; a challenging and fascinating issue here regards the preservation of the *consulter's* autonomy over the lifetime of the contract. (A postprocessing/reworking steps–e.g. on a growing library of modelling templates and heuristics–concludes application of the methodology.)

3. Summary: Enterprise as Agent

Traditional decision theories so far consider Agents of types 1 and 2 only, and in both cases presuppose an immutable identity base. Type 3 Agents add a dimension of complexity by introducing *identity management* as necessary meta-strategy: *Ex definitione,* complex Agents *face* a permanent strategic dilemma resulting from the deficiencies of the IMs with respect to the specific IS each of them is related to (while Type 2 Agents are *subjected* to it and thus need to be *lifted* to Type 3 in order to be able to address it). More precisely, this dilemma mirrors the challenge of coping with (synthesising, integrating, coordinating, selecting among competitors) the collection of partial solutions represented by the IMs. Against this picture, current theory —both, descriptive and prescriptive— regarding strategic decision making of the enterprise is underdeveloped by covering Type 2 agents only. Existing theories cannot explain phenomena of apparent irrationality of Type 3 Agents observed in reality, constraining the practical value of the guidelines they can provide. This is a direct consequence of the inadequacy of their paradigmatic basis, which is conceived too narrowly: Traditional theory of enterprises limits the notion of strategy to a definition of behaviour, often aiming merely at achievement of goals (goal states and conditions) that are already given or readily derived via some standard procedure. The origin of such definitions of the problem domain (relevant state parameters, possible and admissible operators, possible and admissible quality measures) is neither questioned nor addressed. However, it is exactly this aspect of defining the scope and the structure of the problem domain that is central for complex Agents, as they act concurrently in multiple contexts. These contexts are themselves not a given but are *produced* and *enacted* by the society of Agents itself, within exogenous and endogenous physical constraints.

A key concern of our work is the highlighting (recovery) of the relevance of *entrepreneurship* in theorising in management science. Accordingly, it is the notion of enterprise, rather than the firm, that is central to our approach. Enterprises are conglomerates of different agent types: the agenthood of relevant classes of enterprise agents therefore needs to be investigated in detail. Our concern lies with organisations as collective Agents and with human individuals as their constituents. We consider such an encompassing and articulate concept of the enterprise a fundamental prerequisite for the development of a decision theory fit for the real world. This conceptual basis shall enable us to derive a better understanding of the *actual* level of rationality of enterprises, enabling us to identify and implement useful consulting interventions. In contrast to the classical approach, *problem structuring*—the accrual of premises for the decisions processes of agent—*and decision making*—the actual execution of decision processes based on the premises accrued—do not occur in a sequential and centralised fashion and as separate dedicated efforts for these specific aims, but are the result of the interaction of the multiple contributions from different IMs, with the mechanism coordinating between the IMs contributing in important ways to the emergent final result. On the one hand, it is these interactions between IMs that we identify as the cause for the apparent irrationality of the behaviour of a Type 3 Agent; at the same time, the dynamics of these violations of rationality itself shows characteristic regularities that can be described in a principled way. Such a model of the "personality" of an Agent as characteristic of its strategic competence is of practical relevance for: the explanation of current decision making and acting of the agent; to identify promising lines of intervention and consulting; and to anticipate reactions to such consulting action. The different levels of our model map to different levels of consulting activity, defining the dimensions of possible interventions: at the level of SS (coordination patterns and integration of activities, the sphere of contractual relationships); of CS (coordination patterns and integration of behaviours, the sphere of (shared) knowledge); of IS (multiple ideals of being and development, manifested as styles); and of Person (the interplay between IMs for usage of the bounded resources of agent).

A main implication of our model for the organizational structure of Type 3 Agents regards the instantiation of a reflection authority (cf. the extended role of corporate governance and the advisory board of enterprises)—note how the conflicting requirements of acceptance/integration vs. distance/ external perspective may speak in favour of contracting external consultants also in the long run (structured consideration of the external view). This can be contrasted with today's fragmented infrastructure of controllers, strategic auditors, and assorted advisories.

4. Implications and Challenges/Research Perspectives as Discussion Contributions

A main argument put forward regards the importance of a broader and more explicit view of the notion of an agent's environment. This implies complementing the current 'compressed' and intensional representation of a firm's environment in terms of standardised measures and static conceptualisations/ terminology available for the definition of goals with explicit entities allowing to scope and define the very problem domains *within* which goals can be set and qualities measured: An additional key and ongoing responsibility of agents now is to revisit their positioning and orientation (and even their very composition/organisation) within their dynamic setting. Getting back to the role of the notion of rationality, we consider it to gain in relevance by allowing the identification of patterns of *apparent irrationality*, which in turn may point to relevant environmental causal structures[2].

Through the framework under development, we aim at providing a basis for a firm's principled reflection about its structured identity, clarifying the nature and scope of its ongoing "self-entrepreneurship" (i.e. extending it from the mere materialisation of a one-time entrepreneurial endeavour to a capability of continuous creative entrepreneurship) and the related possibilities and constraints (cf. the notion of "double closure" in Luhmann 2000, 228f). We conceive identity in a

[2] Within what we introduced as the Weinhaus Model notions of Social Systems (SS) and Culture Systems (CS).

more differentiated manner, as integration of multiple transpersonal *versions* of identity (cf. also Klein 2010, LeBoeuf et al. 2010) that serve as elementary units of decision theoretic analysis. With this new perspective, the basic assumptions of Rational Choice Theory then need to be reconsidered (see also Fuchs 2001).

In positioning our efforts, we do find some agreement with Parsons' AGIL framework, regarding the proposed basic entities of organism, personalities, social systems and cultural systems, and even more regarding the identified *challenges*, such as the dynamics related to reconciliation of internal and external environments—formulated as the "problems of integration and adaption" (e.g. Parsons 1960, pp.473ff). Parsons' analytical work thus provides interesting opportunities for reflection on our own effort aimed at the development of a practical principled method rather than a theoretical systematization. But while the scope of e.g. Parsons' AGIL model is limited to static and separate modelling, we pursue a consistent trans-personal approach, motivated by and aiming for interventional consequence.

This motivates our strong interest in Luhmann's theorising (Luhmann 1987, 2000), which for the purposes of this abstract we summarise with a short selection of exemplary questions (and of a more basic kind) to be presented for discussion at the Symposium venue: Even if "partial adoption" of identified answers and integration of Social Systems Theory into a *hybrid* methodological *tool* should not be an option (cf. Blühdorn 2000, p.339 as cited in Schoeneborn 2011, p.681), improved awareness of the boundaries and deeper appreciation of the deliberate reifications of our model are essential for its productive application in consulting activity.

- Luhmann developed a fundamental critique of adopting culture as first-class entity (see also e.g. the critique of (Boyd & Richerson, 1985) in (Stichweh, 2002), (Boyd & Richerson 2009) notwithstanding), whereas, with a practice-oriented view on more readily discernable (or, rather: identifiable and accessible) components of the environments (*Umwelt*) of enterprises, we model the dynamics and conceive of the influence of CS as hypercycles between IS that interact with SS (partly in dependency relation, cf. Luhmann 1984, p.37). On the one hand, the radical departure advocated by Luhmann may e.g. expose (or at least: *permit* to identify) key systemic influences "hidden" behind more ostensive appearances. On the other hand, we are committed to the "master guideline" of having to be able to configure *and* instrument (i.e., "feed") a specific Weinhaus model instance for a given client at a practical and useful *level of granularity* and need to be able identify/derive conclusions of interventional value–a key motivation for reifications currently adopted.
- Another rather straightforward and similarly fundamental issue is given by Luhmann's critique of action theory and the related critique of the notion of rationality (or rather: *rationalities* in the plural form) upheld in action theory (Luhmann 1984, p.235 and 638ff.). Here, we sympathise (and fully support!) the proclaimed importance of committing to a truly multi-disciplinary study (e.g. not to delegate the contributions from Psychology to second-class citizenship)–and have a deeper study of the relation of the hormism vs. hedonism debate (cf. Duncker 1941, Frijda 1987) to a Social Systems Theory conception based on conditioning on our agenda. As for the previous item, our emphasis on action theory results in a straightforward manner from the behavioural perspective of our application: the *practical* gain of replacing "acting" (i.e., "behaving" in the Weinhaus terminology) by observation (e.g. Luhmann 2000, p.) is again our measure stick.
- Conative aspects of Social Systems Theory: In the current formulation of the Weinhaus model, the notion of *Entrepreneurial Will* takes on central stage, as the original "attracting force" (or mould) of the enterprise (at least at the outset not necessarily itself a system proper) to be perpetuated throughout the existence of Agents – (possibly) internally in the case of Type 3 Agents, externally for simpler Agent types. Note that here both Entrepreneurial Will as well as the conative forces of Agent (resulting from the characteristic differences of the IS ideal and the associated IM representation) are not atomic concepts: the "demystification" of this part of the Weinhaus Model (cf. Luhmann

2000, p. 172, and p.244ff on *values* as the core ("Letztkomponenten") of organisational culture), the clarification of actual decision *making* (cf. Clancey 2006) are prominent construction sites.

- Complementing research challenges in modelling, another set of questions is centred on methodological issues. These include clarifications of: the notion of *soundness* of goals of the consulting process (e.g., meaningful, achievable, verifiable); applicable criteria and qualities for intervention results (e.g., principled altering of specific probabilities, adaptivity, confrontation potential, …; catalysing autopoiesis of the Personhood of the enterprise); means to critically ascertain the (non)implementation and the (non)impact of interventions.

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About the Author

Karl Neumayer

Karl Neumayer received his M.S. (1981) from the University of Vienna. He then attended the post-graduate programme in sociology at the Institute of Advances Studies (IHS, Institut für Höhere Studien) Vienna). After a career in banking he founded his consulting company KOGNOS Consulting GmbH focussing on corporate strategy consulting. Karl Neumayer is a lecturer on Strategic Management at the University of Vienna.

Paolo Petta

Paolo Petta received his M.S. (1987) and Ph.D. (1994) degrees from the Vienna University of Technology in Austria. He established the Intelligent Software Agents and New Media group at the Austrian Research Institute for Artificial Intelligence (OFAI) in 1996 in the context of early work on situated cognitive control architectures. His current academic activities are focused on contributions to the Middle European interdisciplinary programme in Cognitive Science (MEi:CogSci) at the University of Vienna and the Medical University of Vienna. Ongoing research interests include agent-based modelling and computing and cognitive and emotion-oriented systems.