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## Simple and Complex Organizational Forms: Markets, Hierarchies, and Networks in an ‘Organizational Triangle’

By Wolfram Elsner and Gero Hocker

**Simplistic vs. Complex Organization:**  
**Markets, Hierarchies, and Networks in an ‘Organizational Triangle’**  
--A Simple Heuristic for Real-World Organizational Forms--\*)

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**Abstract:** Transaction cost economics explains organizations in a simplistic ‘market-vs.-hierarchy’ dichotomy. In this view, complex real-world coordination forms are simply considered ‘hybrids’ of those ‘pure’ and ideal forms, thus being located on a one-dimensional ‘line’ between them. This ‘organizational dichotomy’ is mainly based on relative marginal transaction costs, relative lengths of value-added chains, and ‘rational choice’ of coordination form. The present paper, in contrast, argues that pure ‘market’ and ‘hierarchy’, even including their potential hybrids, are a theoretically untenable and empirically void set. Coordination forms, it is argued, have to be conceptualized in a fundamentally different way. A relevant ‘organizational space’ must reflect the dimensions of a complex world such as dilemma-prone direct interdependence, resulting in strong strategic uncertainty, mutual externalities, collectivities, and subsequent emergent process. This, in turn, will lead either to (1) informally institutionalized, problem-solving cooperation (the instrumental dimension of the institution) or (2) mutual blockage, lock-in on an inferior path, or power- and status-based market and hierarchy failure (the ceremonial dimension of the institution). This paper establishes emergent instrumental institutionalized cooperation as a genuine organizational dimension which generates a third ‘attractor’ besides ‘market’ and ‘hierarchy’, i.e., informal network. In this way, an ‘organizational triangle’ can be generated which may serve as a more relevant heuristic device for empirical organizational research. Its ideal corners and some ideal hybrids on its edges (such as ideal clusters and ideal hub&spoke networks) still remain empirically void, but its inner space becomes empirically relevant and accessible. The ‘Organizational Triangle’ is tentatively applied (besides casual reference to corporate behavior that has led to the current financial meltdown), by way of a set of criteria for instrumental problem-solving and a simple formal algorithm, to the cases of the supplier network of ‘DaimlerChrysler US International’ at Tuscaloosa, AL, the open-source network Linux, and the web-platforms Wikipedia and ‘Open-Source Car’. It is considered to properly reflect what is generally theorized in evolutionary-institutional economics of organizations and the firm and might offer some insight for the coming industrial reconstructions of the car and other industries.

## Introduction

Organizational analysis has to be conducted in a theoretical and conceptual frame that reflects actual *real-world* properties of decision spaces of individual agents. Among these, *complexity* is most prominent, pervasive, and indicative. Complexity typically stems from dilemma-prone direct interdependence, resulting strong strategic uncertainty, mutual externalities, collectivities, and bounded rationality, which are ubiquitous dimensions of any social behavior. Complexity triggers subsequent *evolutionary process*. The latter, in turn, may lead to *emergent structure*, particularly to learned institutionalizations of *cooperation* which typically solve the *coordination* problem in situations exhibiting collectivities and dilemmas. Evolutionary process, however, may also lead to mutual blockage, lock-in on an inferior path, or some other complicated system orbit. (On complexity and emergent structure in modeling economies, see, e.g., Liebrand, Messick (eds.) 1996; Lindgren 1997; Foley 1998; see also Schelling 1978; Arthur 1989; Delorme 1997.)

Path-dependent and often cumulative search, learning and adaptation processes thus may lead to multiple equilibria in (formal models of) spontaneous decentralized systems, i.e., most basically *high vs. low institutionalizations* of intra-firm *routines*, firms' outward *strategies*, and *coordination and cooperation forms among firms*. (For the tradition of classical elaborations of firm behavior under uncertainty, evolutionary process, learning, adaptation, and routinizations, see, e.g., Schumpeter 1942; Simon 1957, 1959; Penrose 1959; Cyert, March 1963; Nelson, Winter 1982; many modern evolutionary economists of the theory of the firm refer back as far as Smith and Marshall, see, e.g., Loasby 1976; Kay 1992; Dietrich 1994; Hodgson 1998; Witt 2005).

Proper reflection of complexity and its far-reaching implications, thus, also sheds light on *diverse coordination mechanisms* and forms and hence promotes an understanding of the structures of different allocation and coordination forms, their *interrelations* and potential combinations (see, e.g., Amin, Hausner (eds.) 1997; Block 2000; Langlois 2003).

Broadening the scope of 'coordinational' and organizational analysis, therefore, is also to move beyond the world of only indirect interdependence (mediated through ideal prices only) that still shapes the neoclassical modeling of *ideal 'markets'*, with its isolated, 'autistic' agents, which still provides the *benchmark* coordination form of mainstream analysis. While complexity is increasingly ubiquitous in the *fragmented* and *interconnected* real world (on increasing real-world complexity and organization, see, e.g.,

Ruigrok, van Tulder 1995; Rycroft, Kash 1999; Langlois 2003; Elsner 2005) it is ‘reduced away’ in the neoclassical representation of both ideal ‘markets’ and their *Coasian* dual, *hierarchy* (Coase 1937). Following Williamson (1975), the neoclassical agenda of the theory of the firm has been further developed as the *rational choice* between the (inter-firm) ‘market’ and the intra-firm (i.e., labor, capital, intermediate products) ‘markets’ (see, e.g., Kay 1992). And even after Williamson’s many concessions of heterodox themes and critiques (bounded rationality, history, recurrent interactions, long-run relations, relational investment, power, culture, etc.) during the 1980s, 1990s, and 2000s (e.g., Williamson 1985, 1993, 1995, 1996, 2003; for an in-depth discussion of those differentiations in Williamson’s approach, see, e.g., Groenewegen, Vromen 1997; Pessali, Fernandez 1999) this ideal duality still largely has served as the mainstream benchmark for evaluating real economies, and perhaps ever more so. And this paradigm has remained strictly neoclassical: ‘[T]here is only one causality direction--from individual actions and bilateral exchanges to economic structure. No reference is made [...] to social processes [...] TCT [transaction cost theory – WE] ignores social evolution [...]’ (Pessali, Fernandez 1999, 268-9, also passim; see also, e.g., Knoedler 1995; Pratten 1997).

However, as long as one sticks to the ‘optimal’ and ‘equilibrating market’ left untouched, with (then in turn) ‘optimal’ hierarchies within it, one cannot fully consider complexity and non-optimal, non-equilibrium, and non-teleological process, emergent structure, and the manifold forms of coordination and organization possibly resulting (e.g., Wright, Mukherji 1999). With complex structure, evolutionary process, and emergence, the ‘*boundaries of the firm*’ become not only *shifting* but also *fuzzy*, and both the *vertical* and *horizontal* boundaries then do not only depend on technological opportunities, but on complementary capabilities, absorptive and learning capacities, and path dependencies, and *external relations* of the firm, within the ever changing environment of the whole firm population, become crucial to the firm’s existence and development (e.g., Dosi, Salvatore 1992; Amin, Hausner (eds.) 1997; Hodgson, Knudsen 2000).

This relates to both (1) the *power-based big-corporation* dimension (and its economics tradition from Veblen (1904) through Berle/Means, Schumpeter ‘2’, and Chandler to Galbraith), with its oligopolistic coordination and ‘centralized private sector planning’ (Munkirs 1985) (this tradition has stressed the power- and status-based *ceremonial dimension* of institutionalizations of coordination and organization forms), and (2) the knowledge-based, *learning*, interoperability, and *standardization*-oriented

dimension (and its economics tradition, from Schumpeter '1' through Nelson/Winter) (see, e.g. Nonaka, Toyama 2002) (this tradition has emphasized the *instrumental dimension* of institutionalization of coordination and organization forms more strongly). Strategy, power, path creation, and complex *interrelatedness* of firms may combine into cumulativity, lock in, adverse firm selections, and even whole populations of big cost-pushers (e.g., Dosi, Gianetti, Toninelli (eds.) 1992; Hodgson 1993; Pitelis 1998; Stack, Gartland 2003). And with the growth of the knowledge economy and the increasing requirement of a 'socially embedded knowledge', the neoclassical *organizational dichotomy* becomes an increasingly pointless paradigm of organizational research (e.g., Hodgson 2005).

Thus, the neoclassical dichotomy, although still most virulent in the mainstream, does not appear to be appropriate for analyzing the *manifold observed forms of business interdependence*, coordination, and organization. In fact, real-world economic structures and processes are reflected in a virtually infinite universe of complex models considering interactive agents, with diverse resulting processes and emergent structures, generated already by even rather simple initial structures (see again, e.g., Foley 1998; Watts 1999). Neoclassical ideal 'markets' with isolated individual agents (including firm hierarchies) then would represent just a special case somewhere at the fringes of that universe.

In times of *de-regulation* and 'dis-embedding' of the 'markets', of global spatial and functional *fragmentation of value-added chains* in the face of complex products, and, thus, required *technological interoperability* and *net-technologies*, interdependent decision-making and *coordination* and *cooperation* problems have come to dominate the economy (see, e.g., Ruigrok, van Tulder 1995; Rycroft, Kash 1999; Pratt 1997; Elsner 2005). Instances of *informally institutionalized cooperative forms* to overcome uncertainty and opportunism are *local clusters* with their historically learned, largely price-independent, stable and long-run interrelations as well as more or less formal *strategic networks* (see, e.g., Elsner 2000, 2009b). Hierarchical and network forms typically combine into *hub&spoke* network forms. However, none of these are 'hybrids' in the sense of the neoclassical dichotomy (e.g., Baudry, Gindis 2005).

This is all well-known among heterodox schools since their intense criticisms of transaction cost economics during the 1990s and 2000s (e.g., Winter 1993; Groenewegen (ed.) 1996; Amin, Hausner (eds.) 1997; Nonaka, Toyama 2002; Hodgson 2005; Dietrich, Krafft 2008).

Against this background, this paper starts with (1) a short reconsideration of that conventional *organizational dichotomy*. We will take the ideal ‘market-hierarchy’ dimension to serve as an organizational baseline, although theoretically sterile and empirically void. Therefore, we will develop, in addition, (2) an organizational dimension that we position orthogonally to that baseline dimension and which reflects the degree of interactively learned *institutionalization* of cooperation, including cluster and network forms, i.e., the *value of the instrumental dimension* of an informally emerging institution. Thus, a *two-dimensional organizational space* will be established wherein ‘market’ and ‘hierarchy’ receive some real-world significance and meaning as forms with *instrumental institutional content*. Its new ‘attractor’ is ideal, learned, institutionalized cooperation, which provides the third ‘corner stone’ of a *triangle* conception, in addition to the corners ‘Market’ and ‘Hierarchy’, the new one called (instrumental) *Ideal Institutionalized Cooperation/Network*. While still ideal and empirically void at its corners and edges, this frame can serve as a *heuristic* to better explore both theoretical and real-world organizational forms. This *Organizational Triangle* will subsequently be exposed to (3) real-world organizational forms in some short case studies that will illustrate the conception’s applicability and its ability not only to reflect evolutionary-institutional theory of the firm but to help characterize, allocate, and compare different real-world organizational phenomena and forms.

## **1 The Conventional Transaction-Cost Conceptualization of Organizational Forms: The Organizational Dichotomy and Its Critique**

The neoclassical approach to comparative allocation, coordination, and organization forms has been developed from the ‘transaction cost’ approach (Coase 1937).

### ***Transactions***

A transaction can basically be conceived of as an elementary economic unit of analysis both within and across organizations and thus has the potential to open up the ‘black box’ of the ‘firm’, to analyze ‘markets’ as systems of directly interdependent, institutionally behaving agents, and, therefore, to *conceptualize ‘hierarchies’, ‘markets’, and other potential coordination forms as an inseparable continuum of forms of interactions*. The conception of the ‘transaction’ has originally been elaborated as an institutional economic unit by John R. Commons already before Coase (Commons 1934, Vol. I, 52-74, 336-42; see also, e.g., Pitelis 1998).

The Coasian neoclassical treatment was able to conceptualize only a dichotomy between two allegedly irreconcilable principles (while ‘markets’ in fact, historically, are not conceivable without power and hierarchy, see, e.g. Pitelis 1998). The *rational choice of coordination form to minimize transaction costs* has led to the (artificial) market-hierarchy dichotomy and the different real-world forms observed, particularly cluster and network forms, may be conceptualized therein only as *hybrids* between the two ideal poles.

### ***Williamson’s Affirmation of the Dichotomy***

Williamson’s further elaboration of the issue has more or less confirmed and reinforced that limitation. Although he discusses a broad range of influences on transaction costs, he never actually moves to complex organizational structures and processes beyond ‘rational’ marginal optimization and equilibrium. Those diverse issues mentioned above are always made commensurable to, and in fact subsumed under, the *exclusive transaction-cost dimension* and the established organizational dichotomy. This holds for both why transaction costs matter and the main components of transaction cost (see, e.g., Williamson, 1975, 2003; see also, e.g., Pyatt 1978).

For example, a key factor is asset specificity of investment (in both physical and human capital). Due to bounded rationality of the agents and their need to assume opportunistic behavior of the exchange partner, a potential for hold-up problems exists. These will be anticipated and be taken into account when entering a relation. *Contracts* then are the tool to cope with this, but their inevitable incompleteness prevents addressing all potential problems and conflicts, particularly those arising from asymmetric information, mutual bounded rationality, or mutual ‘strong’ uncertainty. *Vertical integration* (enhancing hierarchy) is offered here to be the only solution.

However, bounded rationality, strong uncertainty, and incomplete contracts may also open the way for more complex forms of coordination, i.e., an elaboration of evolutionary process, institutional emergence, learned *institutionalization of trust* and cooperation, and related *relational contracting* to reduce (mutual) moral hazard and thus transaction costs. Although this has been addressed by Williamson (e.g., Williamson 1981) it has not been elaborated. His discussion remains focused on governance structures to be aligned with, and neatly reducible to, transaction costs and their ‘rational’ economizing so that ‘the firm’ remains ‘something to be derived from comparative transaction cost considerations’ (Williamson 1996, 11).

### ***Transaction Costs in a Complexity Perspective***

It certainly is worthwhile identifying specific transaction costs and attempting to reduce *prohibitive transaction costs*, as present in the cases of *strong uncertainty*, namely initial strong strategic uncertainty, reduced to levels where agents *become capable of action*, particularly innovative action. This, however, will be feasible only as trusting and *correlated (joint, collective) action*. The very concept of *transaction costs* thus may easily include situations that blow up the whole neoclassical organizational dichotomy as in the case of *strong uncertainty* with *prohibitive*, action-blocking information costs (see, e.g., Groenewegen 1996, 9).

Overcoming complex problems in evolutionary processes will be contributing to reducing transaction costs, and economizing on transaction costs would be a byproduct of solving more fundamental problems of strategic uncertainty. However, reducing the focus to quantitative marginal static equilibration and ‘optimization’ of transaction costs as the unique objective of action, prevents a deeper analysis, including analysis of the causes and sources of transaction costs, particularly when agents are facing coordination and dilemma problems. The perspective remains reduced to *one dimension* in terms of both the goal indicator (i.e., transaction costs) and resulting *organizational forms*. Comparative marginal transaction costs and related choice of organizational form determine the *degree of vertical integration*, or *relative lengths of the value-added chains* inside vs. outside hierarchy, i.e., the relative size of the firm vs. the market. This appears to fall short of tackling a number of questions that have surged in the real world.

### ***Ideal Markets and Hierarchies Without Institutions?***

Dietrich and Krafft (2008), in a recent discussion of the economics of the firm, distinguish two perspectives that depend on the time horizon, a *short-termed* and ‘passive’ *Williamsonian* view, contrasting with a *long-termed* focus to be found in the *institutionalist* perspective. In the present paper we assume the institutionalist perspective, asking how emerging institutionalized cooperation to overcome dilemma-prone coordination problems is reflected by organizational forms. The conceptualization used in the following reflects the fact that *hierarchies* and *real-world markets*, as well as clusters and networks, have to be considered *sets of institutions* emerging from complex structures and evolutionary process. ‘Markets’ and hierarchies thus are unavoidably embedded in some minimum institutional arrangement. (To be sure, even the most ‘neoliberal’, de-regulated and ‘disembedded’ market, in reality, is a result of some

institutionalization or ‘culture’, as would be, in the real world, the most extreme individualism or the most radical selfish behavior.)

In fact, what would a ‘*pure market*’ *without institutions* be? Not even the most basic bidding action would be comprehended by other agents. In this way, even the *most de-regulated neoliberal ‘market’ in the real world* that is intended to come close to the ideal of perfect individualism is *fundamentally different* from the ‘pure market’ since it inevitably contains some real-world complexity and thus institutionalizations. This has always been the core of the understanding of ‘markets’ in evolutionary institutional economics (see, e.g., Neale 1994).

Similarly, what would an ideal, ‘*pure*’ *hierarchy without institutions* be? Nothing but an abstract structure of ‘top’ and ‘bottom’ positions where there would be strictly no institutionalized division of labor between ‘top’ and ‘bottom’ agents, i.e., no routinization at all. This means that every single decision to be taken by ‘top’ agents needs to see a different agent (person) in the ‘top’, and correspondingly always different agents in the ‘bottom’ positions, i.e., a permanent rotation of persons on positions. ‘Pure hierarchy’, similar to a pure ‘market’, thus, would raise complexity to such a level that it would become virtually impossible to handle in reality.

Thus, absurdly artificial and hardly comprehensible conceptions of ‘hierarchy’ and ‘market’ would result if institutions were left aside. In fact, the very notion of hierarchy as *rule-based division of labor* between ‘top’ and ‘bottom’ positions, reflected in a comprehensive long-run labor contract, as conceptualized also by Coasian economics, already implies institutions and routines (Nelson, Winter 1982, Ch. 5).

### ***Abstract Vanishing Points***

Nevertheless, these two highly abstract, theoretically absurd, and empirically void organizational principles of a completely chaotic decentralized structure (‘market’) on the one hand and a ‘pure’ structure of ‘top’ and ‘bottom’ positions (‘hierarchy’) on the other may only serve as ‘*vanishing points*’ *in the organizational space* to be developed below.

Overall, the very essence of a realist, complex setting is still not properly theorized in the dimension of the ‘degree of vertical integration’ or ‘value chain-length’. The integration of complexity, process, and institutionalization, reflected in the (informal) ‘institutionalized cooperation’ or the (more formal) organizational ‘network’ dimension, acknowledges the firm as a strategic agent and gives room for it to fill that role in various

organizational ways in its recurrent interactions with other agents. This will allow for comparative empirical analyses of various real-world organizational forms.

## **2 Complexity, Evolutionary Process, and Institutional Emergence: Conceptualizing the Genuine Institutional Dimension and an Organizational Space**

### ***Again: An Abstract Bottom Line***

If we leave the neoclassical dichotomy as it is and if we consequently disentangle it from its obscure and inconsequential references to complexity, uncertainty, power, and institutions, it may provide, as indicated, an abstract *bottom line* with two abstract, theoretically untenable, and empirically void vanishing points. ‘Markets’ and ‘hierarchies’ on this abstract dimension remain ‘pure’, i.e., *without institutions*. Together with some abstract continuum of *hybrids* (with different lengths of value-added chains and degrees of vertical integration) it may constitute a ‘bottom-line’ organizational set which, however, is empirically empty.

Of course, we will have to leave these ‘pure’ forms as soon as we consider a world of direct interdependencies, strong (strategic) uncertainty, dilemma-prone collectivity and coordination problems, resulting complexity, evolutionary process, interactively learned informal coordination, and emergence of institutionalized cooperation (including formal or informal organizational forms of networking).

Immediately beyond the ‘bottom line’, real-world forms apply that, however, are *fundamentally* different from the ‘dismantled’ neoclassical bottom-line forms in that they are forms *cum* institutionalizations in a complex environment. To be sure, real-world forms close to the neoclassical bottom line will have small values of instrumental institutionalization but, logically, high values of the *ceremonial* dimension of institutionalization. The latter, in turn, implies, as mentioned, market and hierarchy failures such as mutual blockage, lock-in, non-action, incapability of coordination and collective action, due to *power- and status-based forms of institutionalization*.

### ***Dilemma-Prone Complexity as an Everyday Problem***

The relevance of the collective-good/social dilemma problem can be seen in its ubiquity as an everyday problem as we have argued elsewhere (e.g., Elsner 2009a). There is in fact a collective-good problem involved in every single economic decision, even in the most simple supermarket purchase, surrounding any technological coordination problem as well,

be it in the fragmented value-added chain or in technology choice problems. If a fully acknowledged institution already exists, then typically any agent *actively contributes* to the reproduction of the institution and of corresponding expectations of others through generally coordinated behavior. However, if an agent expects another agent to behave in a coordinated/cooperative way there possibly exists (depending on the degree of individualism in the prevailing culture, on future expectations, monitoring, and reputation mechanisms working) a *dominant* incentive for her *not to contribute* and thus to take the opportunity of a potential short-run one-shot extra gain (by running away without paying, by somehow cheating, etc.). Similarly, under certain circumstances, in the fragmented value-added chain, the incentive to free-ride by saving R&D expenses may become virulent. Finally, in an *Arthurian* technology-choice problem with net-technologies, agents may be dominantly incited to free ride by waiting and choosing later (e.g., Arthur 1989).

Generally, agents in a strongly individualistic culture may be incited to ‘defect’ in manifold ways, and will do so as far as the situation is not fully governed by institutions, including memory, monitoring and transparency, reputation building, and related sanctioning (if not governed at all by formal hierarchical control).

Along these lines, we have argued elsewhere that any production, information, and innovation system, under conditions of fragmented value-added chains, net-technologies, and the collective-good character of information, can be modeled as a system of mutual externalities, collectivities, and cumulativity, such that it can be reconstructed as a social dilemma in which any transaction or simple coordination problem is embedded (Elsner 2005).

However, the dilemma structure often exists only ‘in the background’, while the observable social *surface* is dominated by its *solutions*, i.e., institutionalized arrangements. These may be ‘instrumental’ (i.e., problem-solving) or ceremonial or ‘locked-in’ on an inferior technology, or even completely mutually blocked through general free-riding and non-action, and this may not even be realized as such by the agents who perhaps do not know better. The ‘surface’ of institutionalized everyday solutions (including lock-in and ‘non-action’) typically is more easily visible than the complex problem structure in the background and its alternative potentialities.

Common individualist decision-making, thus, in an interdependent world, may lead to inferior results, and ideal ‘markets’, or close-to-ideal de-regulated real markets, and the prices resulting in them, may fail to generate and diffuse the shared knowledge and

expectations required for some ‘reasonable’ outcome, i.e., overcoming the dilemma. A solution (superior to mutual individualist blockage or lock-in) then may require a ‘higher’ form of rationality than the non-embedded market can provide by itself.

***Coordination Problems and Social Dilemmas, ‘Coordination’ and ‘Cooperation’, ‘Social Rules’ and ‘Institutions’***

That ‘higher’ form of rationality allowing for shared knowledge and informal coordination will be an institutionalization of cooperation through a learned and ‘*habitualized*’ (habituated) social institution, in the face of a dominant incentive ‘hyper-rationally’ to defect. In a dilemma-prone, decentralized system, the dilemma problem can be overcome, if not through formal and authoritarian mechanisms, only by ‘habitualized’ and ‘semi-conscious’ behavior. This is because the dilemma, with its dominant incentive to defect, is a more severe problem than a simple coordination problem (e.g., a road traffic problem, typically solved by simple coordination through a simple social rule). The coordination, then, has to assume the specific form of *cooperation*, i.e., coordination with sacrificing the potential short-run ‘rational’ one-shot extra gain. The simple social rule then has to become an *institution*, i.e., rule plus endogenous sanction. In this way and with this terminology it typically is depicted in *prisoners’ dilemma* supergame modeling (see, e.g., Schelling 1978; Schotter 1981; Axelrod 1984/2006; van Lange et al. 1992; Liebrand, Messick (eds.), 1996; Lindgren 1997; Watts 1999, Ch. 8; Jackson 2005; Eckert, Koch, Mitloehner 2005; Elsner 2009a) and its embedding in a carefully designed evolutionary ‘process story’ (see Dosi, Winter 2000).

Thus, any solution requires recurrent and sequential interaction, in historical time, to open up room for joint learning, mutually adapting expectations, and, with this, a path-dependent cumulative process to solve (or not) the ubiquitous dilemma problem. This also implies multiple equilibria (fixed points, attractors) among which the system may fluctuate. This also applies to the organizational space to be developed in the following.

***Coordination Forms Cum Institutions: The Organizational Space***

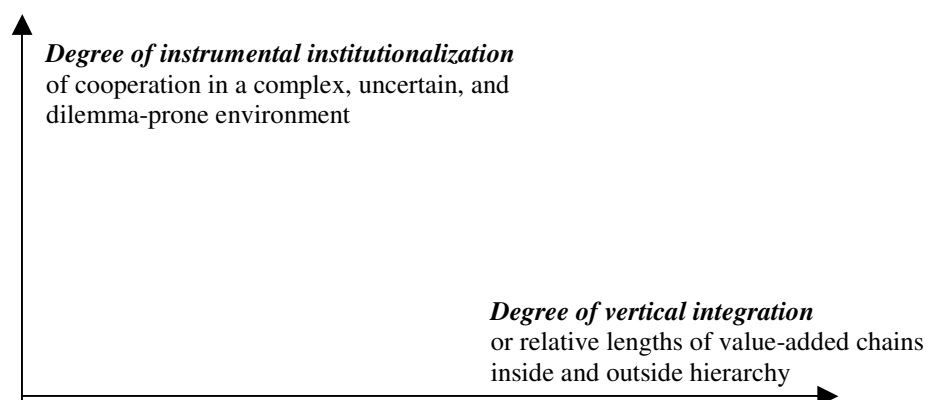
‘Markets’ and hierarchies, in an interdependent world, thus need to be embedded in learned problem-solving and stabilizing institutional arrangements in order to become workable and problem-solving in any meaningful societal sense.

A de-regulated ‘*market*’, for instance, with little instrumental-institutional embedding, typically is the largest enemy of a market that has any meaningful positive (instrumental) effect, because of its unleashed immanent tendencies towards power

concentration, self-abolition, adverse distribution, trust deterioration, reduced innovation capacity, lock-ins, and, in the extreme, mutual blockages of any instrumental action, as we currently observe in the severest financial and economic crisis the world has ever seen.

Similarly, in the real world with its fragmented, deregulated, uncertain, and turbulent environment where much information and innovation has assumed a public-good character and can not completely be appropriated, even the most powerful *hierarchies* turn out to be incapable of effectively dealing with the strong uncertainty involved (as we also can observe in the contemporary global economic crisis). Hierarchies thus are forced to downsize while, in a double movement, they also have to accumulate ever *more power* in order to maintain some control over their increasingly turbulent environment. Hierarchical power in the global corporate economy is exerted nowadays through the command over extensive global supplier networks, thereby multiplying the number of employees that ‘hub’ hierarchies can command beyond their in-house labor force, i.e., *hub&spoke networks*.

Therefore, the real-world organizational dimension builds upon direct interdependence and direct interaction processes, cumulatively learned and *habituated* forms of cooperation to overcome social dilemmas and solve coordination problems. This applies to instrumental *institutionally embedded markets*, instrumentally ‘*routinized*’ *hierarchies* (where routines/institutions are more the learned ‘gene’ rather than just the ‘truces’ of an organization, to use Nelson’s and Winter’s (1982) ‘routines dichotomy’), and instrumental *cluster* and *network* forms of institutionalized coordination, the latter emerging from markets and among hierarchies. For an illustration, see *Figure 1*.



**Figure 1: The Two Dimensions of the Organizational Space.**

As soon as complexity and resulting informal institutions (i.e., informal cooperation) have to be considered, a real-world coordination form will lay *within* the organizational space rather than a hybrid in the neoclassical organizational dichotomy. Put differently, the neoclassical dichotomy receives theoretical and empirical meaning *only* if we allocate empirical coordination and cooperation forms within the space that we are developing here.

The new, and again ‘ideal’ (although complexity-based), corner or attractor point represents instrumental *ideal institutionalized cooperation* which reflects the collective solution of complex problem structures and processes, an institution to yield coordination through cooperation. To be sure, this is not a morally ‘superior’ or somehow more ‘desirable’ organizational limit point but a reflection of real-world complexities and organizational phenomena and their more realistic theoretical modeling.

‘Ideal institutionalized cooperation’ also includes learned *information sharing* and thus comprises *ideal open-source* structures and governance as a specific case existing in the ‘information economy’ (see, e.g., Raymond 1999; Lerner, Tirole 2002; De Laat 2004; Adkisson 2004; Gallaway, Kinnear 2004; Eckert, Koch, Mitloehner 2005). But again, emergent open-source cooperation forms are not expected to exist as ‘pure’, ideal forms, i.e., not without elements of hierarchy and ‘market’, in this framework either.

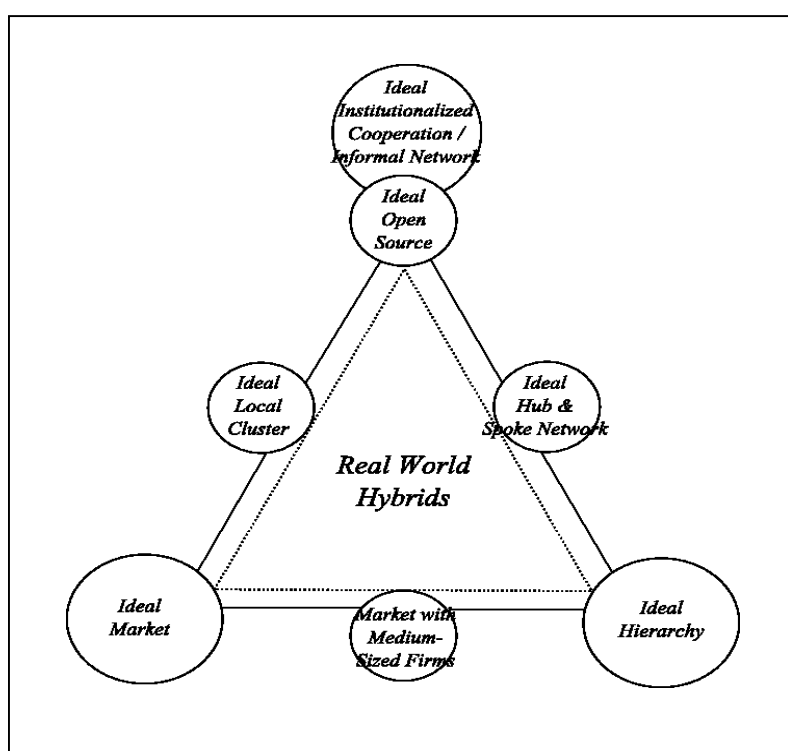
As soon as it comes to the *operationalization* of the *vertical scale* we may refer to the well and long elaborated institutionalist theory of *instrumental value*, or *Social Value Principle* which provides sets of criteria to measure the instrumental content of systems of institutionalization (see Tool, 1985, 1986).

Note that with institutionalized coordination and cooperation breaking down, we move down the *vertical line* (the perpendicular) of the Triangle. Here, while the instrumental dimension becomes weaker and the ceremonial dimension dominant, we may easily apply another important institutionalist approach, the *theory of institutional change*, assuming a process of *gradual ceremonially encapsulation* of learned instrumental knowledge (see Bush 1987). In such more or less instrumentally disembedded and ceremonially encapsulated hierarchy and disembedded and encapsulated markets all kinds of failures and deficiencies will indeed become dominant forms in the real world (as, again, the current global crises strikingly demonstrate). Empirical coordination forms then would come close to the ideal neoclassical bottom line without, however, becoming identical with the abstract ideals.

### *The Organizational Triangle as a Heuristic*

In all, within the *two-dimensional* organizational space that may be constructed this way, we can define *three ideal attractor points* (corners).

This Organizational Triangle may be considered the simplest reflection of complexity which seems to be reasonable beyond the over-simplistic neoclassical dichotomy. As such it is intended to serve as a *heuristic* to analyze real-world organizational forms, i.e., to characterize, *locate*, and *compare* real organizational forms (see *Figure 2*).



**Figure 2: The Organizational Triangle.**

In addition, we may assume *hybrids* not only between the two vanishing points of the neoclassical dichotomy but between each two of the three attractor points. In this way, the Triangle can be further specified.

For example, (spatial) *clusters*, are defined here as informal (‘functional’) coordination forms, reflected by repeated, relatively *stable*, lasting, and relatively price-resistant exchange relations, in this way being some *hybrid* between ideal cooperation and spontaneous *decentralized* private interaction systems where prices play some role (‘markets’) (for a definition and discussion of clusters, see, e.g., Elsner 2000, 2009b).

Ideal clusters, therefore, will be allocated somewhere ‘halfway’ between ‘ideal cooperation’ and ‘ideal market’.

Similarly, *hub&spoke networks* are defined here as some more *formal* and *deliberately contracted* (‘strategic’) forms of multilateral, project bound, and often fix-term cooperation (often emerging from cluster interactions which would mean a move through the middle of the Triangle from left to right). Such networks share their more formal (and hierarchical) character with hierarchies. Hub&spoke networks that, in reality, have come to dominate the global corporate economy, where big corporate hierarchies command many suppliers and service providers, are the prototype of a hybrid between ‘ideal hierarchy’ and an informal ‘ideal network’. They are to be located ‘halfway’ between ideal hierarchy and ideal institutionalized cooperation (see *Figure 2*; for a definition of networks and a two-stage model of cluster-network development, see, e.g., Elsner 2000, 2005, 2009b).

Also, since the neoclassical ‘bottom-line’ corner ‘ideal market’ must be understood as a perfect *atomistic* structure with a maximum length of value-added chains, cars, for instance, could be produced just with a telephone by which the entrepreneur would conclude thousands of *spot contracts* (with realtors, construction people, suppliers, service providers, laborers, etc.) every day. And if ‘ideal hierarchy’ (without ‘markets’ and institutions), in contrast, could be understood as a *monopolistic* global *mega-corporation*, embracing the whole value chain (for one good, at least) in its vertically integrated structure, then the ‘bottom-line’ edge would, ‘halfway’, display something like a ‘mid-sized’ length value chain (or ‘mid-sized’ vertical integration), i.e., something like a ‘*market*’ with *medium-sized firms* (which would display the usual failures of disembedded markets as explained).

Finally, an ideal, informal, learned, cooperative *open-source network* without any hierarchy and with no price-based exchange, as indicated, would be an example of the ideal institutionalized-cooperation corner of the triangle.

In this way, the Organizational Triangle can be specified not only through its *two* dimensions and its three corners but also through *four ideal reference coordination forms* three of which are ‘half way points’ on its edges.

### 3 Case Studies: Real-World Corporate Hub&Spoke and Open-Source Networks Within the Triangle

#### *Real-World Phenomena*

This section will tentatively apply the Organizational Triangle to real-world phenomena. Large *hierarchies*, for instance, that dominate and rule the global corporate economy have reduced their internal value chains in order to reduce costs (see, e.g., Choi, Hong 2002) but have at the same time used and increased power to reduce complexity, control their environment, get command over an extended, often multiplied workforce, distributed all over the world, and stabilize their expectations. In the neoclassical dichotomy, this would mean reducing and extending the firms' value chain at the same time. In difference to this (contradictory) conceptualization, hub&spoke network forms have emerged that both ensure a wider range of resource control at lower costs and deal with the complexities of information and innovation in more flexible ways (see, e.g., Armstrong 2001; Perraton 2001). Open source networks, on the other hand, are driven by learned reciprocity, i.e., the institutionalization of forms of cooperation. Both new organizational prototypes will be explored with real-world examples in the following.

#### *A Simple Metric for Survey Data*

We may apply the Triangle as a heuristic in a first step in a most simple way. In two case studies, we have *interviewed* CEOs, managing directors, and leading experts of the hub firm and its suppliers in a prominent hub&spoke manufacturing network and some leading managers and regional experts of the open-source network of the Linux community. We have surveyed their *self-assessments* of their organizational forms with regard to the space given by the Triangle. Specifically, we have asked a series of questions that were considered to characterize typical relations, i.e., formal *structures*, informal *governance rules*, and *performance*, with respect to each of the three ideal forms and with special consideration of the *instrumental* and *ceremonial* contents of rules, routines, and institutions.

*Questions* included addressed the spatial and social proximity among, and recurrence and frequency of personal contacts (interactions) with, the same agents, the role of prices in the interactions with other agents, the degree of hierarchy among the agents (relations, and specific contractual stipulations, of authority, power, control, and command among the agents), the degrees of learning, voluntariness, trust, reciprocity, and priceless exchanges, knowledge sharing, 'gifts' of knowledge and innovation, the time spans

between giving and receiving, and the efficacy of specific performances of the coordination and organization forms in question. The many statements from long and intensive questionnaire-based interviews have been evaluated in a *text analysis* according to whether they match with the characteristics of ‘ideal market’, ‘ideal hierarchy’, or ‘ideal institutionalized cooperation/informal network’.

Each statement clearly expressing a tendency towards one of the three poles of the Triangle counted as one point. In a simple arithmetic transformation we have combined the answers that were respectively related to the three ideal forms into a metric that determines the *location* of the respective coordination forms on a rough *grid in the Triangle*. In this way, we have gained some tentative application of the Triangle through some preliminary comparative subjective data.

The transformation was carried out with the help of the following equations. The functions  $f$  determine the strength of the relation of the empirical coordination form in question with the respective ideal vanishing points (subscripts:  $m$  = market,  $h$  = hierarchy,  $nc$  = informal network cooperation), which results from the answers that were given,  $A_t$  being the total number of answers obtained for one of the coordination forms,  $A_m$  and  $A_h$ , the numbers of answers pro market and hierarchy, respectively:

$$f_m = \frac{A_m}{A_t} + \left( \frac{A_t - (A_m + A_h)}{2A_t} \right) \quad (1)$$

$$f_h = \frac{A_h}{A_t} + \left( \frac{A_t - (A_m + A_h)}{2A_t} \right) \quad (2)$$

$$f_{nc} = 1 - \left( \frac{A_m + A_h}{A_t} \right). \quad (3)$$

As can easily be seen, we have normalized both the ‘bottom-line’ (between the poles ‘ideal market’ and ‘ideal hierarchy’) and the height of the Triangle to *one* (hence the second summands in equations (1) and (2)) to guarantee comparability between the different coordination forms. Empirical  $f$  values for hierarchy (or market), for instance, are measured on the bottom line (which has length 1) from 0 to 1, beginning at the market (hierarchy) corner, ending (with 1) at the hierarchy (market) corner. Empirical  $f$  values for ideal informal network cooperation are measured along the perpendicular (which also has

length 1) from the upper corner down to the middle of the bottom line, starting from the bottom line (0) and ending at the upper corner (1).

To give a simple numerical example, assume a supplier representative has given 14 usable statements regarding coordination forms during the interview, 3 in favor of 'market', 6 for hierarchy, 5 for ideal network cooperation. Eqs. (1) – (3) then yield a location of the organizational form in question at  $f_h = 0.61$  ( $f_m = 0.39$  correspondingly) on the bottom line (i.e., closer to hierarchy) and at  $f_{nc} = 0.36$  up from the bottom line on the perpendicular. Thus, that organizational form would be located in the lower right half of the triangle.

***Case 1: A Real-World Hub&Spoke Network – Daimler(Chrysler), Tuscaloosa, Alabama, and Its Suppliers***

For a long time, the Daimler(Chrysler) production facility in Alabama (the firm's name is *Mercedes Benz United States International – MBUSI*) has been considered in the literature a prototype of a modern production site and supplier network in the car industry (see, e.g. Pohlmann 1993; Choi, Hong 2002). Also, it was considered a tight hierarchical hub&spoke network with a strong hub that exerts direct influence on its suppliers ('spokes'). In order to reduce complexity through hierarchical influence on the network interactions, MBUSI's site is surrounded by most of their tier-one suppliers. Particularly, most of the exclusive suppliers are required by MBUSI to settle, if not directly on site, within a 30-mile radius. The hub exerts extensive influence on them. Exit and entry rules are fixed and managed by the hub. The hub is able to collect information from its spokes without disclosing its own knowledge to them.

Notably, the dominance of MBUSI over its tier-one suppliers is different for different suppliers. The *degree of dependence* of the suppliers on MBUSI is surprisingly tightly mirrored by the *geographical proximity* of the suppliers' sites to the hub's site. Those suppliers that are located further off the site (none is located farther than around 120 miles) typically do not deliver exclusively to MBUSI. Of these, some are located exactly between their two main customers, mostly MBUSI and BMW, which is located in Spartanburg, SC. They mostly supply the American car corporations in Detroit as well, though. In fact, their contracts with MBUSI do not restrict them to supply MBUSI exclusively. They are mostly located outside a 90 miles circle around the MBUSI site.

These did emphasize their independence in the interviews and, as expected, did assess the weights of the different coordination forms that are effective in their overall relation to MBUSI differently from the exclusive close-by suppliers.

Management representatives from 14 companies have been interviewed. A majority of the companies' representatives and experts interviewed (including MBUSI's interviewees) considered the organizational form of the *MBUSI-supplier entity* more hierarchical than 'market'-oriented, but perhaps surprisingly also more hierarchical than network-oriented. The few more non-exclusive and more distant suppliers located further away naturally tended to consider it more 'market' compared to 'hierarchy'. So the Triangle locations per company ranges from 0.38 to 0.79 (pro hierarchy) on the bottom line and between 0.24 and 0.53 pro 'cooperation network'. In all, the values are around 0.6 'pro hierarchy' (i.e., 0.4 'pro market') and 0.35 'pro network' (for the details of the extensive case study on the MBUSI structure, see Hocker 2008). So the overall subjective allocation of the MBUSI supplier network in the Triangle shows a clear tendency towards the ideal *hub&spoke network*, as might have been expected (see *Figure 3* at the end of the section).

### ***Case 2: A Real-World Open-Source Network – Linux***

The economic literature has devoted a huge amount of analyses to the phenomenon of open-source production and innovation, as a more general economic principle and even an upcoming business model, potentially applicable even in major areas of manufacturing (e.g., Raymond 1999; Adkisson 2004; De Laat 2004; Gallaway, Kinnear 2004; Elsner 2005; Wendel de Joode 2005). Recently, open-source seems to expand into all kinds of online content generation (characterized by the umbrella term 'Web 2.0'). Over all, it appears to be an 'anomaly' to neoclassical mainstream economics, although some individualistic 'rational' reconstructions of many phenomena can perhaps be made (see, e.g., Lerner, Tirole 2002).

The famous Linux 'community' or network as its prototype is characterized by relationships among its members that are considerably less based on hierarchy and more on informal learned institutionalized cooperation including reciprocity and gift exchange. Knowledge seems to be successfully governed more as a collective good. Digital microelectronic information has virtually become subject to non-exclusion, rendering information a full-fledged collective good ubiquitously open to individualistic free-riders.

According to the extensive and still growing literature on Linux (see, e.g., Foray 1988; Cohendet et al. 2001; McKelvey 2001), the network structure is characterized by several minor ‘hubs’ that typically just moderate the exchange processes among the participants without being able to put any pressure on them. The network seems to have triggered fast exchange, joint learning, effective routinization and institutionalization of cooperation, emerging from ‘dense’ repeated interaction.

Mailing lists and news sites frequently report on programmers who have earned professional credit and personal trust. Thus the reputation mechanism seems to be an indicator of a long-run rationality in the theoretical framework of a prisoners’ dilemma supergame, specifically in a stochastic population approach where active partner selection is possible and will be based on monitoring and reputation chains (cf., e.g., Elsner 2005, 2009a).

The ‘Linux-paradigm’ can be seen as an approach towards ‘ideal, institutionalized cooperation’ in the Triangle. However, as a real-world coordination form it obviously cannot be expected to perfectly conform to the ideal. For instance, *hierarchy may interfere* with the cooperative network in the sense that an increasing number of private corporations enter the open-source world, use it as an additional external knowledge source, and Linux hackers are being poached by them. Finally, the Linux kernel itself, basically *privately owned* by Linus Thorvalds, is likewise well managed by a small group of well-selected *core members* of the community, with clearly defined *hierarchical competences* to decide over the basics of the further development of the source code. Thorvalds watches over the contributions to the kernel and a limited number of developers exclusively gets together for some time to create a patch to fix a kernel problem before the problem is made generally available (see, e.g., Thorvalds 2006). We have critically considered the viability of ideal self-governing (open source) networks and their need to be supported and stabilized through ‘enlightened’ and proactive public policies (see, e.g., Elsner 2001, 2005).

Against this background, leading representatives of the *Open Source Development Laboratories* (OSDL) in Portland, OR, and leading representatives of more informal regional Linux communities in Germany have been interviewed the same way as explained in the MBUSI case above (for the details of the structures of the community and the interviews, see again Hocker 2008). All results allocate the Linux community, with some variance for the different groups (central and local) interviewed, in the upper half of the Triangle, more or less close to the ideal. Interestingly, the OSDL central hub considers the

community considerably closer to the ideal ( $f_{nc}$  around 0.73) than the average of the German local groups (around 0.54). Both also see the community slightly on the side of the ‘market’ rather than hierarchy (around 0.48/0.52 ‘pro market’ in the case of OSDL, 0.44/0.56 in the case of the average of the German local groups). Members of the German local Linux groups see tendencies towards the ‘market’ because of the software industry’s interest in Linux hackers. Some of them have turned their hobby into a commercial career. On the other hand, OSDL is a non-profit organization which might explain the more stronger evaluation of its representatives in favor of the ideal. Overall, Linux is located at the coordinate values  $f_{nc}=0.58$  and  $f_m/f_h=0,58/0,42$ . See *Figure 3* again for a graphic depiction of the results.

### ***Cases 3 and 4: Other Internet Open-Source Networks – Wikipedia and Oscar***

Examples that might even come closer to the ‘ideal institutionalized cooperation’/ideal informal network are Wikipedia and the internet-based approach to manufacture an ‘open-source’ car, Oscar. These two shall be shortly considered here for a very tentative allocation in the Triangle.

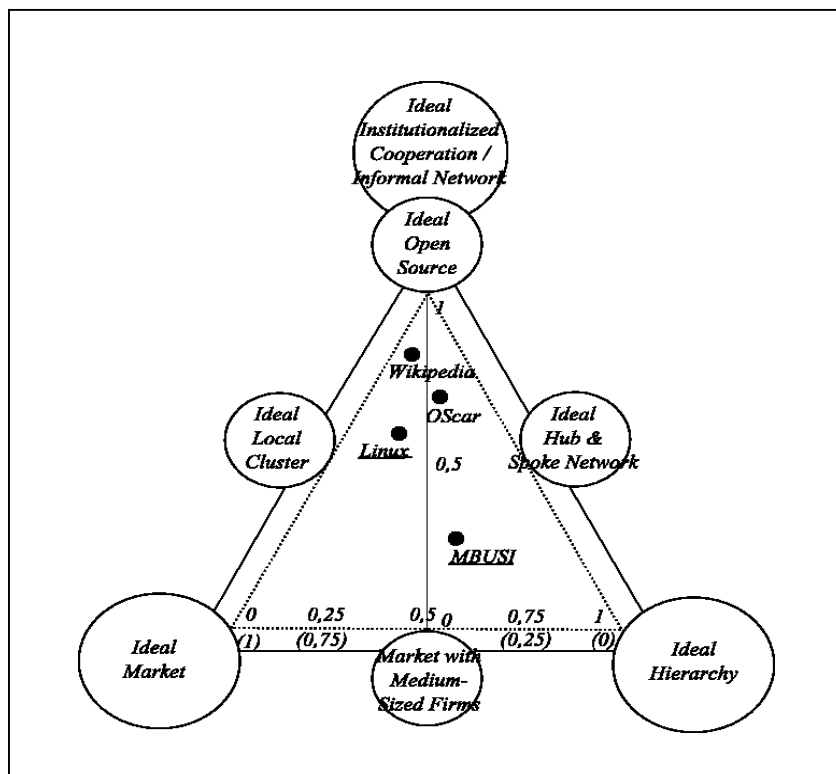
The online-encyclopedia *Wikipedia* works without central guidance, everybody can easily add or change information and someone else can add more and suggest further changes. Also, ‘commercial’, ‘monetary’, or ‘market’ factors do not influence Wikipedia. Of course, it is open to extensive free-riding as it is based on the contributions made by anonymous volunteers who publicly share their knowledge. Due to unrestricted entry and usage, Wikipedia comes close to the ideal of an open-source network.

Since there is no control of contributions (i.e., of topics) it may seem likely that the most widely shared knowledge occupies the largest space in Wikipedia and that this would not necessarily be the most correct or cutting-edge. Accordingly, in that case, Wikipedia would represent the average knowledge of the ‘masses’, including all kinds of ‘folkviews’, ceremonial beliefs, etc. However, preliminary research suggested that compared to a traditional hardcopy encyclopedia, Wikipedia provides more recent, more specific, and more cutting-edge knowledge.

Thus, with even less hierarchy, less central management, and less ‘structure’ than Linux, and with its apparently high-quality open-source knowledge base it appears to be even closer to the ideal open-source informal network structure. We do not attempt a detailed exploration of Wikipedia here, nor have applied a questionnaire to members of the Wikipedia community as in the cases 1 and 2. But indications suggest that Wikipedia is

based on some institution of informal cooperation, reciprocity, and voluntary knowledge sharing. Therefore, we would tentatively locate Wikipedia closer to the ideal informally institutionalized network cooperation in the Triangle (see *Figure 3* below).

The *Oscar*-project builds a bridge between the global hub&spoke structures of usual car manufacturing and the informal open-source networks in software and online content production. Different from Linux and Wikipedia, Oscar can be seen as an attempt to develop a tangible product through open internet exchange (for details, see e.g., Giussani 2007; Oscar 2009; also Honsig 2006). Oscar aims at developing a car without an engineering centre, without a boss, without money, and without borders, but with the help of the creativity in the internet based on voluntary participation of car engineers, designers, colleges, ‘hackers’, and even conventional companies (see, e.g., motorauthority 2008 for BMW’s recent initiative for some open source in car manufacturing). A first prototype is targeted for the end of a period of three years. The principles of the Oscar community include guidelines for the interaction between its members such as ‘everyone has a voice’, ‘knowledge is free’, or ‘the intelligent majority decides’. Such governance rules should qualify Oscar to be located rather close to the institutionalized-cooperative ideal in the Triangle. However, since the platform is managed by a central small group of people with a set of formal rules (that of course can not be enforced) Oscar would have to be located somewhat below Wikipedia, and with its lacking ownership and spatial structures perhaps somewhat above Linux (see *Figure 3*).



**Figure 3: MBUSI, Linux, Wikipedia, and Oscar in the Organizational Triangle**

#### 4 Comparative Organizational Positions

Having tentatively located real-world organizational forms in the Triangle, a short consideration of their comparative combinations of properties may be in order.

##### ***Knowledge Sharing, Common Information Management, and Network Governance***

A point that is noteworthy stems from the fact that the organization of production in supplier networks to meet complexity and cost-reduction requirements makes it difficult for assemblers to pursue proprietary innovations. Since fragmented value-added chains, information and innovation as collectivities, required standardization, and network forms of sourcing and supplying largely prevent keeping innovations as a business secret ('inappropriability' of investment in knowledge creation), especially where suppliers serve more than one assembler, a change in the companies' strategies may be required for both keeping up their competitive advantage and high efficacy and performance in a regional, national, and societal sense. Corresponding 'progressive' value-added chain and supplier network *governance* rules would require levels of learned trust that allow for the outflow of positive externalities from the firm in question to other agents and reverse inflows from them so that profits may be reduced by inevitable outflows but will be compensated by

inflows. In this way, the social dilemmas of production, innovation, and information generation involved could be ‘managed’.

***Open Source for Manufacturing: An Organizational Perspective for the Car Industry?***

In this respect, it would be interesting to investigate the opportunities to *transfer open-source experience* from the software and internet industries into large-scale *manufacturing* networks that typically are of the hub&spoke type. The very existence of a manufacturing-oriented internet network such as *OScar*, with its cutting-edge *green car* prototype, can be considered an attempt to transfer the specific advantages of cooperatively institutionalized open-source information systems into traditional manufacturing. Some open source, although in different degrees and pushed by very different corporate motives, in fact, is beginning to show in a broad wave of business strategies in an increasing number of industries and corporations (see, for instance, Microsoft’s new strategy or the BMW open-source initiative mentioned above). Global corporate car manufacturing might indeed profit from more interactively learned and institutionalized ‘open’ structures in order to reduce transaction costs, broaden and accelerate innovation, and finally ‘greening’ their products by way of broader participation. A first-step requirement for the strategy to organize production processes in greater consistency with complexity structures may be a more ‘open’ approach to communication, i.e., the inclusion of suppliers, services, and other stakeholders, including public agents, into development processes at an early stage, as this may initialize, accelerate, or stabilize social learning processes among agents. In this way, it might increase product quality and speed up innovation. Networks’ ‘speed strategies’ are already well known from the literature on effective clustered regions. For example, an intense cooperation between a number of suppliers of MBUSI that were more independent and located further away from the hub indicates that suppliers indeed may be willing to collaborate if they are given the opportunity to do so. On the other hand, it was reported by several suppliers of MBUSI that they receive orders not from their own headquarters and not even from MBUSI at Tuscaloosa but from the Daimler headquarters in Germany. Finally, the contracts applied by Daimler to its suppliers stipulate that they can be replaced on an annual basis. *Long-term and trust-based contractual agreements*, in contrast, could not only lower transaction costs but reduce uncertainty for all, *extend planning horizons* and thus make *investments in interactive learning and institutionalization* of trust and cooperation rational. Stable institutionalized relations and expectations may be expected to

motivate proactive and creative behavior of suppliers with a positive impact on the innovative and learning capacity of the network.

## 5 Conclusion

The Organizational Triangle, in its institutional dimension and cooperative vanishing point, reflects complexity, social dilemma, strong uncertainty, recurrent interactions, evolutionary process, and possibly interactive learning, emergent institutions of cooperation, reciprocity, stabilization of trust, common knowledge, reduced transaction costs, and high performance. Evolutionary process, however, may also lead to a downward spiraling, possibly ending in lock-in, collective inability of action, mutual blockage, distrust, and institutionalization of power- and status-based ceremonial values, behaviors, and individualistic strategies, mirrored in cumulative organizational and collective failure. Theoretical examples in the broad evolutionary literature have been issues of ‘unintended consequences’, ‘fallacy of aggregation’, herd behavior, etc. The contemporary financial meltdown, beginning real-economic depression, and cumulative global crises in resources, food supply, climate, poverty and distribution, and last not least moral behavior of the ‘elites’ are current striking instances of collective organizational failure, i.e., the lack of coordination and cooperation, or collectivity, to mirror and meet interdependence, complexity, and dilemma.

The Triangle, thus, takes *real-world problem settings* and agents into account. The neoclassical theory of organization, in contrast, with its simplistic organizational dichotomy, despite Williamson’s many attempts to integrate critical issues, cannot sufficiently capture and conceptualize this.

*Real-world* organizational structures, representative of typical hub&spoke structures in large-scale manufacturing and of internet-based open-source structures, have been explored here as examples of the real *diversity of organizational forms* with different mixtures of basic principles. Their *characterization and comparative location* in the Triangle has illustrated that real-world structures are indeed *complex hybrids* of ‘market’, ‘hierarchy’, and ‘institutionalized cooperation/informal network’. Markets and hierarchies then are *no longer ideals* but in their very combination with institutionalizations have become something fundamentally different, namely institutionally embedded, multidimensional, complex, evolving and open-ended, and *empirically accessible* real-world forms.

Therefore, in a world of ubiquitous interdependence, coordination and cooperation problems, the dominant belief in the full accountability of stand-alone firm hierarchies, with their strategies of ever more power exertion to deal with increasing global turbulence, and of self-regulating ‘markets’, however dis-embedded, de-regulated, and ceremonially dominated, does not appear to be economically sustainable both for business and the economy as a whole. For instance, in the MBUSI case, trying to keep innovations within the boundaries of the firm appeared to cause high and rising contractual costs.

Consideration of *comparative location* in the Triangle, thus, suggests that taking on *open-source experience in manufacturing* might improve, initialize, accelerate, stabilize, and broaden innovation, not only for the economy as a whole and not only for the independent small and medium-sized firms involved but in the last instance even for the big powerful global corporations.

Obviously, this analysis, and particularly the transfer of best socio-economic experience into a broad range of industries, would have to be combined with proper ‘*institutional design*’ by a (more enlightened) *public agent*. Proper institutional design would include interaction, learning, coordination, cooperation, and network support through proper shaping of the incentive structures and of the future expectations (‘futuraity’, as established by Commons 1934), as we have elaborated elsewhere (e.g., Elsner 2001), and, finally, proper formal market regulation.

In sum, we have developed an Organizational Triangle based on, determined, and operationalized by *two ideal theoretical dimensions, three ideal organizational principles, and three more ideal hybrid examples* located ‘halfway’ on its edges. *Real-world organizations, through their real hybrid character, turn out to be something fundamentally different* from the ideals, and in this way become empirically accessible through this simple heuristic. This Triangle can be fruitfully *applied to diverse real-world organizations* in *comparative* allocations within its organizational space, as we have briefly illustrated. Thus we can identify, characterize, and compare real-world organizational and governance structures. The Organizational Triangle thus may also provide a frame to *apply evolutionary-institutional analysis*, including the institutional dichotomy, the social value principle, and the theory of institutional change, in the field of organizational forms.

## References

- Adkisson, R.V., 2004 'Ceremonialism, Intellectual Property Rights, and Innovative Activity', *Journal of Economic Issues*, **XXXVIII.2**, 459-66.
- Amin, A., J. Hausner (eds.), 1997, *Beyond Market and Hierarchy: Interactive Governance and Social Complexity*, Guildford and King's Lynn: Biddles.
- Armstrong, P., 2001, 'Science, enterprise and profit: ideology in the knowledge-driven economy', *Economy and Society*, **30.4**, 524-52.
- Arthur, W.B., 1989, 'Competing Technologies, Increasing Returns, and Lock-In by Historical Events', *The Economic Journal*, **99**, 116-31.
- Axelrod, R., 1984, *The Evolution of Cooperation*, New York: Basic Books, (rev. ed. 2006).
- Baudry, B., Gindis, D., 2005, 'The V-Network Form: Economic Organization and the Theory of the Firm', mimeo., Univ. of Lyon 2, LEFI, Oct. 10, 2005.
- Block, F., 2000, 'Disorderly co-ordination: the limited capacities of states and markets', in: *Institutions and the Role of the State*, ed. by Burlamaqui, L., et al., Cheltenham, UK, Northampton, MA, USA: E. Elgar, 53-71.
- Bush, P.D., 1987, 'The Theory of Institutional Change', *Journal of Economic Issues*, **XXI.3**, 1075-116.
- Choi, T.Y., Y. Hong, 2002, 'Unveiling the structure of supply networks: case studies in Honda, Acura, and DaimlerChrysler', *Journal of Operations Management*, **20.5**, 469-93.
- Coase, R.H., 1937, 'The Nature of the Firm', *Economica*, **IV**, 386-405.
- Cohendet, P., Creplet, F., Dupouet, O., 2001, Organizational Innovation, Communities of Practice and Epistemic Communities: the Case of Linux', in: *Economics with Heterogeneous Interacting Agents*, ed. by Kirman, A., Zimmermann, J.B., Berlin et al.: Springer. 303-26.
- Commons, J.R., 1934, *Institutional Economics. Its Place in Political Economy*, New York: Macmillan, repr. New Brunswick, NJ, USA: Transaction Publ., 1990.
- Cyert, R.M., March, J.G., 1963, *A Behavioral Theory of the Firm*, Englewood Cliffs, NJ: Prentice-Hall.
- De Laat, P.B., 2004, 'Evolution of Open Source Networks in Industry', *The Information Society*, **20.4**, 291-99.
- Delorme, R., 1997, 'The Foundational Bearing of Complexity', in: Amin, A., J. Hausner, (eds.), *Beyond Market and Hierarchy: Interactive Governance and Social Complexity*, Guildford and King's Lynn: Biddles, 32-56.
- Dietrich, M., 1994, *Transaction Cost Economics and Beyond: Towards a New Economics of the Firm*, London: Routledge.
- Dietrich, M., J. Krafft, 2008, 'Towards an Historically Relevant Economics of the Firm', in: W. Elsner, H. Hanappi (eds.), *Varieties of Capitalism and New Institutional Deals – Regulation, Welfare, and the New Economy*, Cheltenham, UK, Northampton, MA, USA: E. Elgar, 103-21.
- Dosi, G., Winter, S.G., 2000, 'Interpreting Economic Change: Evolution, Structures, and Games', *LEM Working Paper Series 2000/08*, Pisa, Italy: Univ. of Pisa.
- Dosi, G., Salvatore, R., 1992, 'The Structure of Industrial Production and the Boundaries between Organizations and Markets', in: A. Scott, M. Stolper (eds.), *Pathways to Regional Development*, Boulder, CO: Westview Pr.
- Dosi, G., Giannetti, R., Toninelli, P.A., (eds.), 1992, *Technology and Enterprise in a Historical Perspective*, Oxford: Oxford Univ. Pr.
- Eckert, D., St. Koch, J. Mitloehner, 2005, 'Using the Iterated Prisoner's Dilemma for Explaining the Evolution of Cooperation in Open Source Communities', in: M.

- Scotto, G. Succi (eds.), *Proceedings of the First International Conference on Open Source Systems*, Genova, 186-91.
- Elsner, W., 2000, 'An Industrial Policy Agenda 2000 and Beyond – Experience, Theory and Policy', in: W. Elsner, J. Groenewegen (eds.), *Industrial Policies after 2000*, Boston, Dordrecht, London: Kluwer Acad. Publ., 411-86.
- Elsner, W., 2001, 'Interactive Economic Policy: Toward a Cooperative Policy Approach for a Negotiated Economy', *Journal of Economic Issues*, **XXXV.1**, 61-83.
- Elsner, W., 2005, 'Real-World Economics Today: The New Complexity, Co-ordination, and Policy', *Review of Social Economy*, **LXIII.1**, 19-53.
- Elsner, W., 2009a, 'The Process and a Simple Logic of "Meso". Emergence and the Co-Evolution of Institutions and Group Size', *Journal of Evolutionary Economics* (forthcoming).
- Elsner, W., 2009b, 'Regional Service Clusters and Networks: Statistical Identification and Empirical Development', *International Review of Applied Economics* (forthcoming).
- Foley, D.K., 1998, 'Introduction', in: D.K. Foley (ed.), P.S. Albin, 1998, *Barriers and Bounds to Rationality: Essays on Economic Complexity and Dynamics in Interactive Systems*, Princeton, NJ, USA: Princeton Univ. Pr., 3-72.
- Foray, D., 1998, 'The Economics of Knowledge Openness: Emergence, Persistence and Change of Conventions in the Knowledge Systems', in: *Trust and Economic Learning*, ed. by Lazaric, N., Lorenz, E., Cheltenham, UK, Northampton, MA, USA: E. Elgar. 162-89.
- Gallaway, T., Kinnear, D., 2004, 'Open Source Software, the Wrongs of Copyright, and the Rise of Technology', *Journal of Economic Issues*, **XXXVIII.2**, 467-74.
- Giussani, B., 2007, 'A Dutch open-source car', [www.lunchoverip.com/2007/04/a\\_dutch\\_opensou.html](http://www.lunchoverip.com/2007/04/a_dutch_opensou.html).
- Groenewegen, J., 1996, 'Transaction Cost Economics and Beyond: Why and How?', in: Id., (ed.), *Transaction Cost Economics and Beyond*, Boston, Dordrecht, London: Kluwer Acad. Publ., 1-9.
- Groenewegen, J., Vromen, J., 1997, 'Theory of the Firm Revisited: New and Neo-institutional Perspectives', in: L. Magnusson, J. Ottoson, (eds.), *Evolutionary Economics and Path Dependence*, Cheltenham, UK, Brookfield, VT, USA: E. Elgar.
- Hocker, G., 2008, *Market-Hierarchy-Networking: Coordination in Times of Globalization, Fragmentation, and Uncertainty*, Frankfurt/M.: P. Lang Publ., Series 'Structural Change and Structural Policy', ed. by W. Elsner, Vol. 18.
- Hodgson, G.M., 1993, 'Transaction Costs and the Evolution of the Firm', in: C. Pitelis, (ed.), *Transaction Costs, Markets and Hierarchies*, Oxford, UK, Cambridge, MA, USA: Blackwell, 77-100.
- Hodgson, G.M., 1998, 'Competence and contract in the theory of the firm', *Journal of Economic Behavior & Organization*, **35**, 179-201.
- Hodgson, G.M., 2005, 'Knowledge at Work: Some Neoliberal Anachronisms', *Review of Social Economy*, **LXIII.4**, 547-65.
- Hodgson, G.M., Knudsen, T., 2000, 'Capabilities, Learning and the Nature of the Firm: Why Transaction Cost Theory May Provide an Incomplete Explanation', mimeo., paper presented at the annual conference of the European Association for Evolutionary Political Economy, Berlin.
- Honsig, M., 2006, 'Das offenste aller Autos' (The most open of all cars'), *Technology Review* 2/2006, [www.heise.de/tr/artikel/print/68663](http://www.heise.de/tr/artikel/print/68663).

- Jackson, M.O., 2005, 'A Survey of Network Formation Models: Stability and Efficiency', in: G. Demange, M. Wooders (eds.), *Group Formation in Economics. Networks, Clubs, and Coalitions*, Cambridge, UK: Cambridge Univ. Pr., 11-57.
- Kay, N.M., 1992, 'Markets, False Hierarchies and the Evolution of the Modern Corporation', *Journal of Economic Behavior and Organization*, **17.3**, 315-33.
- Knoedler, J., 1995, 'Transaction Cost Theories of Business Enterprise from Williamson and Veblen: Convergence, Divergence, and Some Evidence', *Journal of Economic Issues*, **XXIX.2**, 385-95.
- Langlois, R.N., 2003, 'The vanishing hand: the changing dynamics of industrial capitalism', *Industrial and Corporate Change*, **12.2**, 351-85.
- Lerner, J., Tirole, J., 2002, 'Some simple economics of open source', *Journal of Industrial Economics*, **50.2**, 197-234.
- Liebrand, W.B.G., Messick, D.M., (eds.), 1996, *Frontiers in Social Dilemmas Research*. Berlin et al.: Springer.
- Lindgren, K., 1997, 'Evolutionary Dynamics in Game-Theoretic Models', in: *The Economy as an Evolving Complex System II*, ed. by Arthur, W.B., et al. Reading, MA, USA: Addison-Wesley, 337-67.
- Loasby, B.J., 1976, *Choice Complexity and Ignorance*, Cambridge, UK: Cambridge Univ. Pr.
- McKelvey, M., 2001, 'The Economic Dynamics of Software: Three Competing Business Models Exemplified Through Microsoft, Netscape and Linux', *Economics of Innovation and New Technologies*, **10**, 199-236.
- motorauthority, 2008: 'BMW seeking partners for open-source car software platform', <http://www.motorauthority.com/bmw-seeking-partners-for-open-source-car-platform>, website visited Nov. 3, 2008.
- Munkirs, J., 1985, *The Transformation of American Capitalism*, Armonk, NY: M.E. Sharpe.
- Neale, W.C., 1994, Art. 'Institutions', in: G.M. Hodgson, W.J. Samuels, M.R. Tool (eds.), *The Elgar Companion to Institutional and Evolutionary Economics*, Vol. I, Aldershot, UK, Brookfield, VT, USA: E. Elgar, 402-6.
- Nelson, R.R., Winter, S.G., 1982, *An Evolutionary Theory of Change*, Cambridge, MA, London, UK: Belknap/Harvard Univ. Pr.
- Nonaka, I., Toyama, R., 2002, 'A firm as a dialectical being: towards a dynamic theory of a firm', *Industrial and Corporate Change*, **11.5**, 995-1009.
- Oscar, 2009: [www.theoscarproject.org](http://www.theoscarproject.org), visited February, 23, 2009.
- Penrose, E., 1959, *The Theory of the Growth of the Firm*, Oxford: Blackwell.
- Perraton, J., 2001, 'The global economy - myths and realities', *Cambridge Journal of Economics*, **25**, 669-84.
- Pessali, H.F., Fernández, R.G., 1999, 'Institutional Economics at the Micro Level? What Transaction Costs Theory Could Learn from Original Institutionalism (In the Spirit of Building Bridges)', *Journal of Economic Issues*, **XXXIII.2**, 265-75.
- Pitelis, C.N., 1998, 'Transaction Costs and the Historical Evolution of the Capitalist Firm', *Journal of Economic Issues*, **XVII.4**, 999-1017.
- Pohlmann, A., 1993, 'Stars and Sites', *manager magazin*, No. 10, 196-205.
- Pratt, A., 1997, 'The Emerging Shape and Form of Innovation Networks and Institutions', in: *Innovation, Networks and Learning Regions?*, ed. by Simmie, J.M., London, Bristol, Penns., US: J. Kingsley Publ., 124-36.
- Pratten, S., 1997, 'The Nature of Transaction Costs Economics', *Journal of Economic Issues*, **XXXI.3**, 781-804.

- Pyatt, G., 1978, 'Marginal Costs, Prices, and Storage', *The Economic Journal*, **88.352**, 749-62.
- Raymond, E.S., 1999, *The Cathedral and the Bazaar*, Sebastopol, CA: O'Reilly.
- Ruigrok, W., van Tulder, R., 1995, *The Logic of International Restructuring*, London, New York: Routledge.
- Rycroft, R.W., Kash, D.E., 1999, *The Complexity Challenge. Technological Innovation for the 21<sup>st</sup> Century*, London, New York: Pinter.
- Schelling, T.C., 1978, *Micromotives and Macrobehavior*, New York, London: W.W. Norton.
- Schotter, A., 1981, *The economic theory of social institutions*, Cambridge, UK: Cambridge Univ. Pr.
- Schumpeter, J.A., 1942, *Capitalism, Socialism and Democracy*, New York: Harper&Row.
- Simon, H.A., 1957, *Administrative Behavior*, New York: Macmillan.
- Simon, H.A., 1959, 'Theories of decision-making in economics and behavioral science', *American Economic Review*, **49**, 253-83.
- Stack, M., Gartland, M.P., 2003, 'Path Creation, Path Dependency, and Alternative Theories of the Firm', *Journal of Economic Issues*, **XXXVII.2**, 487-94.
- Tool, M.R., 1985, *The Discretionary Economy: A Normative Theory of Political Economy*, Boulder, CO: Westview Pr.
- Tool, M.R., 1986, *Essays in Social Value Theory*, Armonk, NY: M.E: Sharpe.
- Torvalds, L., 2006, 'Reclusive Linux founder opens up', Internet Interview, <http://edition.cnn.com/2006/BUSINESS/05/18/global.office.linustorvalds> (accessed July 17, 2006).
- Van Lange, Paul A.M., Liebrand, Wim B.G., Messick, David M., Wilke, Henk A.M., 1992, Introduction and Literature Review, in: Wim B.G: Liebrand, David M. Messick, Henk A.M. Wilke (eds.), *Social Dilemmas Theoretical Issues and Research Findings*, Oxford et al., Pergamon Press, 3-28
- Veblen, T.B., 1904 (2005), *The Theory of Business Enterprise*, New Brunswick, NJ: Transaction Publ., 5<sup>th</sup> pr.
- Watts, D.J., 1999, *Small Worlds. The Dynamics of Networks between Order and Randomness*, Princeton, NJ, Oxford, UK: Princeton Univ. Pr.
- Wendel de Joode, R. v., 2005, *Understanding Open Source Communities – An Organizational Perspective*, PhD Thesis, TU Delft.
- Williamson, O.E., 1975, *Markets and Hierarchies: Analysis and Antitrust Implications – A Study in the Economics of Internal Organization*, New York: Free Pr.
- Williamson, O.E., 1981, 'The Modern Corporation: Origins, Evolution, Attributes', *Journal of Economic Literature*, **19.4**, 1537-68.
- Williamson, O.E., 1985, *The Economic Institutions of Capitalism: Firms, Markets, Relational Contracting*, New York: Free Pr.
- Williamson, O.E., 1993, 'The Logic of Economic Organization', in: O.E. Williamson, S.G. Winter (eds.), *The Nature of the Firm. Origins, Evolutions, and Development*, New York, Oxford UK: Oxford Univ. Pr., 90-116.
- Williamson, O.E., 1995, 'Hierarchies, Markets and Power in the Economy: An Economic Perspective', *Industrial and Corporate Change*, **4.1**, 21-49.
- Williamson, O.E., 1996, 'Efficiency, Power, Authority and Economic Organization', in: J. Groenewegen (ed.), *Transaction Cost Economics and Beyond*, Boston et al.: Kluwer Acad. Publ., 11-42.
- Williamson, O.E., 2003, 'Examining Economic Organization through the Lens of Contract', *Industrial and Corporate Change*, **12.4**, 917-42.

- Winter, S.G., 1993, 'On Coase, Competence, and the Corporation', in: O.E. Williamson, S.G. Winter (eds.), *The Nature of the Firm. Origins, Evolutions, and Development*, New York, Oxford, UK: Oxford Univ. Pr., 179-95.
- Witt, U., 2005, 'The evolutionary perspective on organizational change and the theory of the firm', in: K. Dopfer, (ed.), *The Evolutionary Foundations of Economics*, Cambridge, UK: Cambridge Univ. Pr.
- Wright, P., Mukherji, A., 1999, 'Inside the firm: Socioeconomic versus agency perspectives on firm competitiveness', *Journal of Socio-Economics*, **28**, 295-307.