

The Organization of Cooperative Work

Beyond the 'Leviathan' Conception of the Organization of Cooperative Work

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ABSTRACT

The paper examines the relationship between cooperative work and the wider organizational context. The purpose of the exploration is not to contribute to organizational theory in general, but to critique the transaction cost approach to organizational theory *from the point of view of cooperative work*. The paper posits that the formal conception of organization – organization conceived of in terms of ‘common ownership’ – is inadequate as a conceptual foundation for embedding CSCW systems in a wider organizational context. The design of CSCW systems for real-world application must move beyond the bounds of organizational forms conceived of in terms of ‘common ownership’.

THE PROBLEM

The current comprehensive transformation of the political economy of modern industrial society is engendering a new regime of demands and constraints on the realm of work. The business environment of modern manufacturing, for instance, is becoming rigorously demanding as enterprises are faced with increasingly global competition, contracting product life cycles, radical product diversification, and the need to pamper customers — with the concomitant transformation of the organization of production towards order-driven production bordering on custom-tailoring, insignificant or completely eradicated inventories and buffer stocks, shortened lead times, dwindling batch sizes approximating batches of one, concurrent processing of multiple different products and orders, and so forth [6; 19; 36; 61]. The transformation does not merely affect manufacturing and directly related industries. The demands of an educated and critical populace (and the needs of manufacturing and other industries), compel administrative agencies, health and service organizations, and so forth to drastically improve their innovative capability, operational flexibility, and product quality. Accordingly, modern work organizations must be able to adapt rapidly and diligently to changes in environ-

mental conditions and demands and the same time be able to coordinate and integrate their distributed activities in an efficient and effective way. Altogether, this requires horizontal and direct coordination and integration of activities within and across functions and professional boundaries within the organization or among a network of organizations. The permanent managerial campaigns bear witness to that: Flexible Manufacturing, Concurrent Engineering, Design for Manufacturability, Total Quality Control, Business Reengineering, and so on.

Accordingly, modern work organizations require support from advanced information systems that can facilitate the horizontal coordination of distributed decision making. Simultaneously, the proliferation of powerful workstations in cooperative work settings and their interconnection in comprehensive high-capacity networks provide the technological foundation to meet this need. Such developments are illustrated in the area of Computer Integrated Manufacturing (CIM) by the efforts to apply computer-based technologies to integrate formerly separated functions such as design and process planning, marketing and production control, etc., and by similar efforts in areas such as Office Information Systems (OIS), Computer Aided Design (CAD), Computer Aided Software Engineering (CASE) to facilitate and enhance the exchange of information across organizational and professional boundaries.

These developments inaugurate a fundamental shift in the approach to the design of computer systems. In the design of conventional computer-based systems for work settings the core issues have been to develop effective computational models of pertinent structures and processes in the field of work (data flows, conceptual schemes, knowledge representations) and adequate modes of presenting and accessing these structures and processes as represented in computer systems (user interface, functionality). Surely, normally computer systems were used in organizational settings and were even often used by multiple users as in the case of systems that are part of the organizational infrastructure (e.g., database systems). Nevertheless, the issue of how multiple users work together and articulate (coordinate, schedule, interrelate, integrate, mesh, fuse) their individual activities — ‘through’ the system or ‘around’ it — was not addressed directly and systematically, as a design issue in its own right. So far as the underlying model of the structures and processes in the field of work was ‘valid’, it was assumed

that the articulation of the distributed activities was of no import or that it was managed somehow by whoever it might concern. It was certainly not a problem for the designer or the analyst. With CSCW, however, the very issue of how multiple users work together and articulate their individual activities has become the focal issue [51].

Now, cooperative work is not a separate work domain. Rather, CSCW addresses a set of crucial design issues that are common to different application domains such as MIS, OIS, CIM, CASE, etc. and CSCW systems should thus be conceived of as a distinct category of facilities incorporated in the various domain specific applications.¹ For example, in the work domain of mechanical design, CSCW mechanisms supporting the articulation of distributed activities may be incorporated in project management tools, CAD tools, and process planning tools as well as in generic ‘groupware’ tools such as departmental calendar systems and collaborative writing tools. Thus, as CSCW facilities are introduced in different applications and their functionality is enhanced, users will be inundated with overhead activities of articulating the different mechanisms: updating each mechanism with respect to changes to other mechanisms. In order to prevent CSCW systems from thereby introducing an impedance between the multitude of interlaced — individual and cooperative — activities, a CSCW environment must provide means for establishing links between the different mechanisms incorporated in the different applications and systems, at least locally and temporarily. Furthermore, since cooperative work is articulated with respect to and in terms of domain-specific objects and structures, CSCW mechanisms incorporated in applications must provide access to these objects and structures, e.g., via information systems providing access to common repositories (previous designs, components, work in progress, drawings, patents), to other available human and technical resources (skills, machinery), to statutory constraints, and so on.

Thus, a central problem in the design of CSCW facilities that are actually able to support real-world cooperative ensembles in handling the increasing complexities of their work, is to provide an appropriate ‘interface’ to the wider *organizational context* as represented by other CSCW facilities incorporated in other applications as well as domain-specific information systems such as MIS, OIS, CIM, and CASE systems [15; 17; 42]. The challenge is, as Ellis and Keddara aptly put it, to make groupware ‘organizationally aware’ [16].

With this in mind, the objective of the present paper is to examine the issue of the relationship between cooperative work and the wider organizational context. In doing so, the paper will concentrate on a critique of the Transaction Cost approach, not because of its weaknesses but because of its potential strengths as a conceptual foundation for the design of information systems and other computer-based infrastructures in organizational settings: (1) it identifies the relative costs of information processing under different degrees of

‘uncertainty’ as the underlying generative mechanism of the emergence of organizations; (2) it offers a healthy dose of crass realism by conceiving of conflicting goals and motives as constituent of organizational formations; and (3), by combining the two, it posits a generative mechanism for the emergence and development of organizational formations. Taken together, these features of Transaction Cost theory makes it potentially amenable to concurrent design of information systems and business organizations [8-10; 28]. Thus, in examining the relationship between cooperative work and the wider organizational context, we should examine the applicability of the Transaction Cost approach.

The purpose of the discussion is not to contribute to organizational theory in general, nor is it to critique Transaction Cost theory as a theory of institutional economics, but to critique the Transaction Cost approach *from the point of view of cooperative work*: Does it provide a theoretical foundation for a conception of the relationship between cooperative work and the wider organizational context? Accordingly, the following discussion does not pretend to review the vast body of literature constituting the Transaction Cost movement. Rather, in order to unravel the underlying assumptions and discuss their pertinence with respect to CSCW issues, the discussion focuses on the classics of the movement.

THE ‘LEVIATHAN’ APPROACH TO ORGANIZATIONAL THEORY

While most contributions to Transaction Cost theory address important aspects of cooperative work and the organization of cooperative work, they all investigate cooperative work and organizational interactions *from the point of view of the firm* — not from the point of view of cooperative work. The reason being that the central issue for the Transaction Cost movement is the *relationship between organization and market*.²

The problem that haunts the different authors in this movement is how to reconcile the radical presuppositions of Neo-Classical Economics with the manifest existence of firms and corporations encompassing multiple actors engaged in various activities. Why do some economic interactions occur within firms and other corporate entities while other interactions do not? Or, to use the classic metaphor of Adam Smith and Wright Mills, why is the Invisible Hand of market-mediated coordination replaced by the Visible Hand of direct administrative coordination [34; 54]?

¹ We have discussed the issues concerning such facilities (‘computational mechanisms of interaction’) at length elsewhere [49; 52; 53].

² Ouchi has created much confusion in the transaction cost school by defining an organization “as any stable pattern of transactions” [38, p 132] — only to contradict this definition on the very same page by stating: “In this definition, a market is as much an organization as is a bureaucracy or a clan.” (p. 132) Typically, however, the patterns of transactions in markets are not particularly stable; to the contrary, they are typically volatile and transient. And if the pattern of transactions is not stable then, according to Ouchi’s own definition, there is no organization, market or no market. What he intends to say is that organization and market are two alternative governance structures.

Commons

The Transaction Cost school may be said to originate with the work of Commons on the economic origins of ‘collective action’ [59, p. 3; 60, p. 550]. The analysis by Commons is based on the proposition that “conflict of interest” is universal and fundamental to political economy. He is in this respect building on Hume and Malthus who, according to Commons, “made scarcity the basis of coöperation, fellow feeling, justice, and property” [12, p. 6].

According to Commons, then, economic activity involves not only ubiquitous and rampant conflict of interest but also — given the mutual dependence of the conflicting interests — the endeavor to bring “order out of the conflict of interests” through the collective action of various institutions [12, p. 4]. Consequently, Commons’ conceives of organization as a “collective action” established through “coöperation”, that is, through the institutional subjection of individual self-interests to the putative common good. The firm and other forms of “collective action” is thus a governance structure emerging to curb the centrifugal forces of individual self-interests. Commons’ notion of organization is thus closely related to the Hobbesian Leviathan that is called for to prevent “that miserable condition of Warre, which is necessarily consequent [...] to the naturall Passions of men, when there is no visible Power to keep them in awe, and tye them by feare of Punishment to the performance of their Covenants” [22, Chap. XVII, p. 223]. Thus, in a language strongly reminiscent of Hobbes’, Commons expounds his concept of “coöperation”: “coöperation does not arise from a *presupposed* harmony of interests, as the older economists believed. It arises from the necessity of *creating a new harmony* of interests — or at least order, if harmony is impossible — out of the conflict of interests among the hoped-for coöperators. It is the negotiational psychology of persuasion, coercion, or duress. The greatest American piece of actual coöperation, latterly under ill repute [anno 1934], is the holding companies which suppress conflicts, if persuasion proves inadequate. A more universal coöperation, suppressing conflict in behalf of order, is proposed by Communism, Fascism, or Nazism. These have found their own ways of submerging conflicts of interest. Hence, harmony is not a presupposition of economists — it is a consequence of collective action designed to maintain rules that shall govern the conflicts.” [12, pp. 6 f.]

The most influential contribution by Commons, however, is his introduction of *the transaction* as the “unit of economic activity”: “I made the transaction the ultimate unit of economic investigation, a unit of transfer of legal control.” [12, pp. 4, 55]. For Commons, transactions occur between actors defined in terms of ownership. That is, transactions occurs when goods are transferred across boundaries of private property; “transactions [...] are the transfer of ownership” [12, p. 58]: “Transactions [...] are the alienation and acquisition, between individuals, of the right of future ownership of physical things, as determined by collective working rules of society. The transfer of these rights must therefore be negotiated between the parties concerned, according to the working rules of society, before labor can produce, or consumers can consume, or commodities be physically deliv-

ered to other persons.” [12, p. 58]. That is, a transaction can be seen as an interface between conflicting interests. Consequently, the notion of transaction is imbued with this sentiment: “I make conflict of interest predominant in transactions. But I conclude that this cannot be allowed to be the only principle, because there are also mutual dependence and the maintenance of order by collective action.” [12, p. 6] In these two sentences, Commons stated the core of the program of the subsequent Transaction Cost movement: Conflict of interest is predominant in transactions; because of the mutual dependence of the warring parties, however, order must be established and maintained by collective action in the form of organization.

Coase

What Commons did not explain or even address was the obvious question: Why are some transactions carried out within organizations while others are carried out beyond the auspices of organization?

This question was addressed and — to some extent — solved by Coase, another pioneer of the transaction cost approach to the theory of the firm. Coase retains the dichotomy of market and firm. Thus, quoting D. H. Robertson’s colorful description, he conceives of firms as “islands of conscious power in this ocean of unconscious cooperation like lumps of butter coagulating in a pail of buttermilk” [11, p. 388]. Or in his own words: “Outside the firm, price movements direct production, which is coordinated through a series of exchange transactions on the market. Within a firm, these market transactions are eliminated and in place of the complicated market structure with exchange transactions is substituted the entrepreneur-coordinator, who directs production. It is clear that these are alternative methods for co-ordinating production.” [11, p. 388].

Coase’s innovation was to explicitly conceive of markets and firms as alternative “governance structures” and to explain the proportions of market and firm coordination by measuring the administrative costs of each in the same unit, namely transaction costs. Both modes of economic coordination carry costs of administering a transaction: the costs of discovering relevant prices and of negotiating, implementing, and enforcing a contract in the market, versus the managerial costs of organizing transactions in the firm. “The main reason why it is profitable to establish a firm would seem to be that there is a cost of using the price mechanism” [11, p. 390]. Firms exist where the cost of conducting a transaction within the firm is less than the cost of conducting the same transaction in the market: “a firm will tend to expand until the costs of organising an extra transaction within the firm become equal to the costs of carrying out the same transaction by means of an exchange on the open market” [11, p. 395]. Taking the analysis a step further, Coase identifies the source of the cost of using the price mechanism by highlighting the “uncertainty” facing economic actors: “It seems improbable that a firm would emerge without the existence of uncertainty” [11, p. 392].

According to Coase, all economic activity requires transactions defined as an act whereby “resources are allocated” between the different “factors of production” [11, pp. 389,

391]. In redefining transactions this way, and thus conceiving of “transaction[s] within the firm” [11, p. 395], Coase enables us to conceive of markets and hierarchies as alternative governance structures, that is, alternative “coordination instruments” for the “allocation of resources” [11, p. 389], and he makes the transaction concept far more powerful. However, his solution raises another problem, namely: What constitutes a transaction, then? Coase did not address this problem explicitly, he merely seemed to assume [11, p. 388] that all work could, in principle, be carried out by individuals who then interact and coordinate on the open market (at a higher cost, of course).³

This, however, is not a realistic assumption, to put it mildly. As already pointed out by Hodgskin [23] at the dawn of the industrial era: “Wherever division of labour exists, and the further it is carried the more evident does this truth become, scarcely any individual completes of himself any species of produce. Almost any product of art and skill is the result of joint and combined labour. So dependent is man on man, and so much does this dependence increase as society advances, that hardly any labour of any single individual, however much it may contribute to the whole produce of society, is of the least value but as forming a part of the great social task. In the manufacture of a piece of cloth, the spinner, the weaver, the bleacher and the dyer are all different persons. All of them except the first is dependent for his supply of materials on him, and of what use would his thread be unless the others took it from him, and each performed that part of the task which is necessary to complete the cloth? [...] Each labourer produces only some part of a whole, and each part having no value or utility of itself, there is nothing on which the labourer can seize, and say: ‘This is my product, this will I keep to myself.’ (Emphasis added.) [23]

That is, if the performance of an individual cannot be measured, the notion of a transaction does not make any sense. Thus, when confronted with the realities of cooperative work, transactions as a “unit of analysis” is not as simple as assumed by Coase (not to mention Commons). What is the exact relationship between the realities of cooperative work and transactions? This problem was addressed innovatively by Williamson.

Williamson

Following his predecessors, Williamson makes transactions “the basic unit of analysis” [60, p. 549]. However, in Williamson’s analysis, economic interactions do not necessarily take the form of transactions. Rather, he posits, transactions take place between — at the ‘interface’ between — different cooperative work arrangements: “A transaction occurs when a good or service is transferred across a technologically separable interface. One stage of activity terminates and another begins.” [60, p. 552].

³ That claim is made explicitly by Ouchi: “The 10,000 individuals who comprise the workforce of a steel mill could be individual entrepreneurs whose interpersonal transactions are mediated entirely through a network of market and contractual relationships.” [38, p. 134].

Williamson makes is perfectly clear that cooperative work activities that are brought together under the same scheme of common ownership in order to share resources are technologically separable: “the joining of separable stations — for example, blast furnace and rolling mill, thereby to realize thermal economies — under common ownership is not technologically determined but instead reflects transaction-cost-economizing judgments” [60, p. 556]. That is, according to Williamson, a cooperative work arrangement (the cooperative activities taking place at a “station” such as a steel furnace or a hot rolling mill) is not “technologically separable”.⁴ In other words, according to Williamson cooperative work at “stations” has a unitary and indivisible character that is “technologically determined”. Thus, in Williamson’s conception, *cooperative work arrangements and transactions are complementary units of analysis*. The one starts when the other terminates, and vice versa.⁵

By defining the unit of analysis, the transaction, with reference to the interface between technologically separable cooperative entities, and by thus taking cooperative work into account, at least nominally and marginally, Williamson supersedes the implicit individualism of Neo-Classical Economics and of his predecessors and relates his reasoning to the realities of cooperative work that massively characterize the realm of work in modern industrial society. Thus, according to Williamson, firms are *aggregations of cooperative work arrangements*, not of atomic individuals. Nonetheless, for Williamson, like Coase, the reason for the emergence of firms is “market failure”. The cooperative work arrangements are joined under “common ownership”, even though they are technologically separable entities, in order to counter market imperfections caused by bounded rationality and opportunism. Williamson thus retains the dichotomy of market and hierarchy.

Accordingly, Commons’ Hobbesian notion of the organization as a common power to keep the centrifugal forces of self-interest in awe is echoed in Williamson’s notion of contracting as a means to curb “opportunism”: “if agents [...] were fully trustworthy, comprehensive contracting would still be feasible (and presumably would be observed). Principals would simply extract promises from agents that they would behave in the manner of steward when unanticipated events occurred, while agents would reciprocally ask principals to behave in good faith. Such devices will not work, however, if some economic actors (either principals or agents) are dishonest (or more generally, disguise attributes or preferences, distort data, obfuscate issues, and otherwise confuse transactions), as it is very costly to distinguish opportunistic from non-opportunistic types *ex ante*.” [60, p. 554].

⁴ Ouchi’s analysis [38], while pretending to follow Williamson’s, is actually an emulation of Coase’s. Like Coase, Ouchi assumes that all economic activity could be carried out by individuals on the market.

⁵ It is worth noticing that this definition of transaction is radically different from the one offered by Commons and the one offered Ouchi.

The general conception of organization developed by the Transaction Cost approach can be summarized as follows: Organizations are entities of *common ownership*: “islands of conscious power in this ocean of unconscious cooperation like lumps of butter coagulating in a pail of buttermilk”. They arise so as to provide a governance structure to certain types of transactions for which market exchanges are inadequate (less cost-efficient) as a governance structure. Outside the organizational boundary is the market, “inside management exercise authority and curb opportunistic behavior” [41].

CRITIQUE OF THE ‘LEVIATHAN’ APPROACH

As far as design of CSCW systems (as well as the design of work organizations) is concerned, the Transaction Cost approach suffers from the following fundamental problems:

1. *The myth of the primordial market.* The basic methodological presupposition of the Transaction Cost approach is to conceive of the market as the default governance structure. The market is taken to be the Natural State, as it were: “The technique is to contend that all transactions can be mediated entirely by market relations” [38, p. 133]. Hence the persistent preoccupation with the question why market forces have failed wherever an organization can be observed. However, this methodological contention is empirically unfounded — as any student of archaeological, historical, and ethnographic evidence will know. Or, to be quite candid, it is a fiction [41].

Along with the presupposition that the market is the default governance structure, the Transaction Cost approach has inherited the implicit radical individualism underlying Neo-Classical Economics. In the Transaction Cost world — that is, the world as seen from a Transaction Cost perspective — individuals only interact as opportunistic actors trying to maximize their own individual gains. Of course, opportunistic behavior is part and parcel of economic life, under the auspices of “common ownership” as well as on the “open market”, and in designing CSCW system this fact of life must certainly be taken into account [18; 25; 37]. But when promoted to the general generative mechanism of organization, the conception of organization as a (cost-efficient) governance structure for curbing opportunistic behavior among economic actors becomes a gross exaggeration. When this notion is applied as the dominant or exclusive conception of cooperative work in organizational settings, essential aspects of the multi-faceted phenomenon of cooperative work is marginalized or simply lost: the cooperative work itself: operating of the hot rolling mill or the blast furnace and interacting through changing the state of the hot rolling mill or the blast furnace; the many technical and social skills required; the effort of maintaining a mutual awareness by monitoring what others are doing and making one’s own work publicly visible; the mutual help [20; 21; 40].

2. *The dichotomy market versus hierarchy.* The organization is conceived of as a Leviathan, “a common Power to keep the all in awe” [22, Chap. XIII, p. 185]. It is a monolith constituted by “common ownership” and controlled from one

center in the sense that there is, somewhere, a set of consistent interests and goals to which the opportunist behavior can be subjected by a single and unitary will that presumably also exists somewhere.

It is difficult, if not impossible, to relate the highly abstract notion of “common ownership” to the infinitely differentiated relations of ownership and possession and rights and obligations that characterize the realm of work: Employees will for instance successfully treat the pencils, desks, computers, etc. they use in their work as *their* possession.

Also, as pointed out by, inter alia, Powell [41], Best [6], and Stinchcombe [55] the rich variety of organizational forms adopted by contenders on the market is ignored by the market/hierarchy dichotomy: firms, corporations, multi-divisional corporations, joint-ventures, strategic alliances, equity partnerships, collaborative consortia for large-scale research, supplier networks (e.g., Toyota and its association of 35,000 suppliers), co-operatives, ‘quasi-firms’ in construction, tacit networks of recurrent contractors in publishing, and regional networks and industrial districts (e.g., Modena in Emilia-Romagna, the textile industry in Baden-Württemberg, the Route 128 in the US). “Many firms are no longer structured like medieval kingdoms, walled off and protected from hostile forces. Instead, we find companies involved in an intricate latticework of collaborative ventures with other firms, most of whom are ostensibly competitors.” [41, p. 301]

The dichotomy of market and hierarchy underlying Transaction Cost theory does not help us here. In the words of Powell: “By sticking to the twin pillars of markets and hierarchies, our attention is deflected from a diversity of organizational designs that are neither fish for fowl, nor some mongrel hybrid, but a distinctly different form.” [41, p. 299]. In fact, on closer inspection, categories such as ‘market exchange’ and ‘common ownership’ tend to lose their superficial clarity: “When the items exchanged between buyers and sellers possess qualities that are not easily measured, and the relations are so long-term and recurrent that it is difficult to speak of the parties as separate entities, can we still regard this as a market exchange? When the entangling of obligation and reputation reaches a point that the actions of the parties are interdependent, but there is no common ownership or legal framework, do we not need a new conceptual tool kit to describe and analyze this relationship? Surely, this patterned exchange looks more like a marriage than a one-night stand, but there is no marriage license, no common household, no pooling of assets.” [41, p. 301].

3. *The dichotomy of cooperative work and organization.* Williamson’s attempt to define transactions as the interface between technologically separable units, ‘stations’ — which are, in their turn, non-separable cooperative work arrangements — suffers from a dichotomy quite similar to the market/hierarchy dichotomy. Williamson’s concept of transaction does not take into account that cooperative work arrangements are constituted by interdependencies of different nature and intensity. In his analysis, the units are either ‘technologically separable’ — or not. Thus, while he attempts to accommodate for the realities of cooperative work,

the notion of a singularity (as the subject of transactions), is still at work. As a result, since the formation of organization, in Williamson's analysis, begins at the boundary of the cooperative work arrangement, cooperative work and organization are of different worlds. Organization is not organization of cooperative work but of transactions between otherwise unrelated singularities — like potatoes in a sack [30, p. 180].

The Transaction Cost approach does not enable us to grasp the rich multiplicity of interdependency and reciprocity among actors in cooperative work arrangements. The Transaction Cost world is populated by singularities (individuals in the case of Commons, Coase, and Ouchi, and 'stations' of cooperative work in the case of Williamson) who are partially conflicting and mutually repellent and whose only interactions take the abstract form of allocations of resources. What else might occur in organizational life is beyond Transaction Cost.

The Transaction Cost notion of organization is that of a system of decontextualized and dematerialized administrative regulation of transactions between singularities. That is, firms are only conceived of as *administrative governance structures*. In the words of Best: "It is an advance to envisage the firm as a governance structure as opposed to a production function, but Williamson's concept of governance structure is not given much force. The production activities themselves are independent of the governance structure. Governance refers simply to administrative coordination. But Big Business is about more than coordination of, in Williamson's words, 'technologically separable entities' [...]; it is also about interrelations amongst mutually interdependent units. [...] A theory of the firm must move beyond considerations of coordination with concepts that allow for links between governance structure and production performance..." [6, p. 115]

The Transaction Cost approach has proved to be quite useful in requirements analysis in administrative work domains (e.g., public administration, corporate administration, banking, insurance) [10; 45; 46]. Beyond these domains, however, the abstract notion of organization as an administrative governance structure is fundamentally inadequate. More importantly, in the context of CSCW, the facets of organizational life that the Transaction Cost approach can grasp are marginal to the rich variety of interactions of cooperative work and its articulation.

BEYOND THE 'LEVIATHAN' APPROACH

The weaknesses of Transaction Cost approach as conceptual basis for the design of CSCW systems for organizational settings (and for the design of work organizations), can be attributed to its intellectual roots in Neo-Classical Economics and contract theory. These roots reveal themselves in the market mythology, the radical individualism, the dichotomy of market and hierarchy, the purely administrative notion of coordination, and so on.

However, by combining the seminal contribution of the Carnegie-Mellon school of organizational theory, especially the concepts of task uncertainty and bounded rationality [14;

29; 56], with the economic concept of the relative costs of handling these complexities and uncertainties under different arrangements, Transaction Cost theory (in particular Williamson [59; 60] and Ciborra [9; 10]) has sketched a sound materialistic approach to analyzing organizational formations that — when released from the fetters of market mythology and radical individualism as well as the dichotomy of market and hierarchy and the purely administrative notion of coordination — provides us with something that can serve as Ariadne's thread in the labyrinth of the organization of cooperative work.

Perspectives of a 'cooperative work' approach to organizational theory

First, however, we need to establish that 'organization' is such an enormously complex and infinitely faceted phenomenon that the mere thought of developing an overarching theory of the organization phenomenon seems unrealistic (for want of stronger words). Given that, we must learn to live with multiple perspectives — each serving and defined by a specific purpose — and distinguish multiple superimposed organizational formations.⁶

From the point of view of cooperative work, the following four perspectives on organization are particularly relevant:

- (1) the *cooperative work arrangement* as an emergent formation;
- (2) the *work organization* as a relatively persistent pattern of cooperative work arrangements;
- (3) the *formal organization* as a governance structure regulating the diverse, partially incongruent interests within the cooperating ensemble;
- (4) the *firm*, the *network*, etc. as different forms of market-oriented organization.

In the following sub-sections we will discuss these four perspectives on cooperative work and its organization.

Cooperative work arrangement

The point of departure is to conceive of cooperative work in terms of actual interdependence in work, as opposed to the notion of 'cooperation' as institutional subjection of individual self-interests to a putative common good that stems from the notion of the primordial market and the concomitant radical individualism. In fact, the concept of 'cooperative work' has a long tradition in economic and sociological investigation. It was used as early as the first half of the 19th century by economists such as Ure [57] and Wakefield [58] as the general and neutral designation of work involving multiple actors and was further developed by Marx [32] who defined it as "multiple individuals working together in a conscious way [planmässig] in the same production process or in different but connected production processes." In this century, the term has been used extensively with the same general meaning by various authors,

⁶ The justification of, and need for, a 'multi-layer' approach has been demonstrated quite convincingly in the work of LaPorte, Rochlin and others [27; 43; 44].

especially in the German tradition of the sociology of work [e.g., 3; 4; 24; 33; 40].

A cooperative work relationship is constituted by the fact that multiple actors are transforming or controlling a complex of *mutually interacting* objects and processes. They are, so to speak, working on the same ‘field of work’ [50]. They are therefore mutually dependent *in their work* in the sense that one actor depends on the quality and timeliness of the work of the others and vice versa [51].

Because of the underlying and constitutive interdependence, individual actors must articulate (divide, allocate, coordinate, schedule, mesh, interrelate, etc.) their respective activities. Thus, by entering into cooperative work relations, the participants must engage in activities that are, in a sense, extraneous to the activities that contribute directly to fashioning the product or service and meeting the need. The obvious justification of incurring this ‘overhead cost’ and thus the reason for the emergence of cooperative work formations is, of course, that actors could not accomplish the task in question if they were to do it individually, at least not as well, as fast, as timely, as safely, as reliably, as efficiently, etc. [47]. Thus, a shift from cooperative to individual work can be observed wherever and whenever new technologies augment the capabilities of individual actors to accomplish the given task individually: combine harvesters, bulldozers, pocket calculators, word processors, etc.

Generally speaking, cooperative work relations are formed because of the limited capabilities of single human individuals faced with the complexity and uncertainty of the task, that is, because the work could not be accomplished otherwise, or at least could not be accomplished as quickly, as efficiently, as well, etc., if it was to be done on an individual basis. In the words of Barnard: “If we eliminate from consideration personal satisfaction [...], their coöperation has no reason for being except as it can do what the individual cannot do. Coöperation justifies itself, then, as a means of overcoming the limitations restricting what individuals can do” [5, p. 23]. More specifically, a cooperative work arrangement may emerge in response to different requirements and may thus serve different generic functions [47]:

Augmentation of capacity: A cooperative work arrangement may simply augment the mechanical and information processing capacities of human individuals and thus enable a cooperating ensemble to accomplish a task that would have been infeasible for the actors individually. As an ensemble they may, for instance, be able to remove a stone that one individual could not move one iota. This is cooperative work in its most simple form. By cooperating, they simply augment their capacity: “With simple cooperation it is only the mass of human power that has an effect. A monster with multiple eyes, multiple arms etc. replaces one with two eyes etc.” [31, p. 233].

Differentiation and combination of specialties: A cooperative work arrangement may combine multiple *technique-based specialties*. In augmentative cooperation the allocation of different tasks to different actors is incidental and temporary; the participants may change the differential allo-

cation at will. By contrast, technique-based specialization requires an ‘exclusive devotion’ to a set of techniques. That is, as opposed to the contingent and reversible differentiation of tasks that may accompany augmentative cooperation, the *technique-based specialization is based on an exclusive devotion to a repertoire of techniques*. In the words of the eulogist of technique-based specialization, Adam Smith: “the division of labour, by reducing every man’s business to some one simple operation, and by making this operation the sole employment of his life, necessarily increases very much the dexterity of the workman” [54, p. 7.]. The different techniques must be combined, however, and the higher the degree of technique-based specialization, the larger the network of cooperative relations required to combine the specialties [2, §§ 263-268, pp. 211-216]. That is, *technique-based specialization requires combinative cooperation*. This combinative cooperation is defined by Marx as “cooperation in the division of labor that no longer appears as an aggregation or a temporary distribution of the same functions, but as a decomposition of a totality of functions in its component parts and unification of these different components” [31, p. 253].

Mutual critical assessment: A cooperative work arrangement may facilitate the application of multiple problem-solving *strategies and heuristics* to a given problem and may thus ensure relatively balanced and objective decisions in complex environments. Under conditions of uncertainty decision making will require the exercise of discretion. In discretionary decision making, however, different individual decision makers will typically have preferences for different heuristics (approaches, strategies, stop rules, etc.). Phrased negatively, they will exhibit different characteristic ‘biases’. By involving different individuals, cooperative work arrangements in complex environments become arenas for different decision making strategies and propensities where different decision makers subject the reliability and trustworthiness of the contributions of their colleagues to critical evaluation. [47]. This process of mutual critical evaluation was described by Cyert and March [14] who aptly dubbed it ‘bias discount.’ Even though dubious assessments and erroneous decisions due to characteristic individual biases are transmitted to other decision makers, this does not necessarily entail a diffusion or accumulation of mistakes, misrepresentations, and misconceptions within the decision-making ensemble. The cooperating ensemble establishes a negotiated order.

Confrontation and combination of perspectives: A cooperative work arrangement may finally facilitate the application of multiple *perspectives* on a given problem so as to match the multifarious nature of the field of work. A perspective, in this context, is a particular conceptualization of the field of work, that is, a conceptual reproduction of a limited set of salient structural and functional properties of the field of work, such as, for instance, interdependencies, generative mechanisms, causal laws, and a concomitant body of representations (taxonomies, models, notations, etc.).

To grasp of the diverse and contradictory aspects of the field of work as a whole, the multifarious nature of the field of work must be matched by a concomitant multiplicity of per-

spectives on the part of the cooperating ensemble. The application of multiple perspectives will typically require the joint effort of multiple agents, each attending to one particular perspective and therefore engulfed in a particular and parochial small world. The cooperative ensemble must articulate (interrelate and compile) the partial and parochial perspectives by transforming and translating information from one level of conceptualization to another and from one object domain to another [47].

In sum, a cooperative work arrangement arises simply because there is no omniscient and omnipotent agent.

Cooperative work arrangements are thus conceived of as transient formations, emerging contingently to handle specific requirements — in response to the requirements of the current situation and the technical and human resources at hand — merely to dissolve again when there is no need for multiple actors and their coordinated effort to handle situations. Different requirements and constraints and different technical and human resources engenders cooperative work arrangements of different size and shape.

By conceiving of cooperative work arrangements in terms of actually interdependent activities (as opposed to legal criteria), a business firm may encompass multiple cooperative work arrangements with no mutual interaction and, conversely, a cooperative work arrangement may cut across corporate boundaries and may involve partners in different firms at different sites.

Whereas Williamson assumes that cooperative work arrangements are permanent singularities (... as far as the theory is concerned), cooperative work arrangements are here taken to be dynamic and emergent formations. Furthermore, the relations of mutual dependence that constitute the cooperative work arrangement are by no means uniform. To the contrary, the interdependencies of the activities of the cooperating actors differ with respect to complexity, coupling, and uncertainty [26; 39; 50; 62]. That is, in a cooperative work arrangement different activities may depend on other activities in different ways and with different intensity. A cooperative work arrangement is therefore not a uniform network that can be taken as a singularity, an atomic element solely interacting with other atomic elements via market-mediated transactions or via the administratively mediated transactions of a firm but should rather be conceived of as a complex of interdependent activities whose interdependencies differ in kind and intensity. Thus, cooperative work arrangements are not discrete entities, singularities whose internal composition and topology can be ignored, but rather dynamic networks of varying intensity and density.

Work organization

Now, establishing a cooperative work arrangement entails an *initial* overhead cost — not in terms of transaction costs, i.e., the cost of handling allocation of resources and performance measurement and remuneration — but in terms of (a) the need for identifying likely and appropriately skilled partners and negotiating the allocation of tasks and responsibilities, and (b) the need for new partners to acquire particular skills and become acquainted with local settings and

practices. Therefore, in order to reduce this initial overhead, cooperative work is normally *organized* — in the sense that the articulation of cooperative activities assumes a specific and relatively stable *organizational form*.

In other words, under conditions of recurrent tasks, cooperative work arrangements exhibit persistence in terms of the composition of the cooperative ensemble (as a cohort) and the allocation of tasks and responsibilities within it. In accordance with the general usage in the literature, we will suggest the term ‘work organization’ to denote the relatively stable composition and structure of the cooperative work arrangement as determined by the demands and constraints of the work environment, that is, the decomposition of the work into tasks, the allocation of tasks within the ensemble, and the combination of tasks into jobs [7; 13; 35].

That is, in order for cooperative work to be an economically viable way of working, the arrangements cannot — as the rule — be established in an *ad hoc* manner. A certain orderliness is required in terms of the stability and reliability of the composition and structure of the ensemble. The degree and form of orderliness required depends, of course, on the specific demands and constraints posed by the specific work environment such as, for instance, adaptability and safety of the operation, reliability of product quality, reliability and timeliness of delivery, and so forth.

For example, having observed that advanced manufacturing systems are tightly coupled to vendors and customers and that this may place severe demands on the adaptive capacity of the system, Cummings and Blumberg conclude that for advanced manufacturing systems the “appropriate work designs should be oriented to groups of employees rather than individual jobs, and to employee self-control rather than external forms of control, such as supervision. This calls for self-regulating work groups” [13]. In the same vein, Aoki observes that the semi-horizontal mode of coordination required in modern flexible manufacturing operations “crucially depends on the skills, judgment, and cooperation of [a] versatile and autonomous work force on the shop floor”, and “a certain degree of blurring of job territoriality between workers on the one hand and foremen, engineers, programmers, etc., on the other” [1].

Likewise, a cooperative work arrangement operating in a safety-critical environment, for example a governmental policy making body, will need to devote resources to prevent decisions that may jeopardize the system itself or its environment. The classical method applied by civil services faced with political risks and a high degree of task complexity is to involve multiple officers to decision making tasks so as to ensure that any decision is assessed critically by multiple actors. In general, the higher the risk and the higher the degree of discretion in decision making, the higher the degree of (apparent) redundancy in the work organization is likely to be [27; 44].

By thus defining the work organization as a constellation of deployable resources configured so as to meet the needs of a, more or less broadly defined, repertoire of recurring cooperative activities, the emergence and configuration of the

work organization is conceived of in terms the costs of searching for and acquiring the required resources on as the need arises versus the costs of maintaining resources in a stand by mode.

Furthermore, since cooperative work arrangements may cut across boundaries of ownership, the work organization may as well cut across such boundaries.

Formal organization

A cooperative work arrangement invariably involves multiple individuals with partially diverging interests and motives; its organization is thus, in a sense, a “coalition” of individuals motivated by individual interests and aspirations and pursuing individual goals [14, p. 27]. That is, cooperative work activities will hardly take place if these discordant interests are not mediated and regulated in some way. Thus, as observed by Barnard: “In coöperation the objective of action is necessarily removed from the individual, requiring a new form of activities, those of distribution.” [5, p. 36]. “Personal purposes cannot be satisfied through coöperative action except as there comes into the action an intermediate process. This process is distributive.” [5, p. 32.]

In other words, participants in cooperative work activities will ask, overtly or tacitly: What’s in it for me? And if they are not satisfied, or convinced, that their contribution to the joint effort is worthwhile they may withdraw their contribution (again overtly or tacitly). Thus, a *governance structure of contractual arrangements* administrating the allocation of resources and the measurement and remuneration of performance within the cooperative ensemble is required which we, again in accordance with the literature, can call the *formal organization* in the sense that the arrangement is explicitly defined (e.g., in the form of statutes) and can be enforced through legal or administrative means.

Superimposed on the shifting patterns of cooperative work arrangements and the provision of adequate skills in the form of the work organization, we then enter the world analyzed by Transaction Cost theory. However, the analysis outlined here does not take ‘market failure’ as the point of departure but, to the contrary, the fact that work is done cooperatively in the first place and conceives of the formal organization as a required governance structure of the cooperative ensemble. The formal organization of cooperative work is required independently of whether the members cooperating ensemble are independent operators, employees of the same firm or of several firms. This analysis is corroborated by Stinchcombe’s analysis of contractual arrangements: “A structure with legitimate authority; with a manipulable incentive system; with a method for adjusting costs, quantities, and prices; with a structure for dispute resolution; and with a set of standard operating procedures looks very much like a hierarchy, very little like a competitive market. Yet all these features of hierarchy are routinely obtained by contracts between firms in some sector of the economy.” [55, p. 198].

From a cooperative-work perspective, then, the formal organization is, essentially, a contractual governance structure influencing the behavior of individuals (and collectives) in

accordance with the interests of the other members of the ensemble as well as the interests of external stakeholders to which the ensemble may be accountable such as customers, shareholders, creditors, government agencies, industrial federations, trade unions, consumer groups, standardization agencies, etc.

Firm, network...

Finally and obviously, cooperative ensembles often take the form of a *firm*, in the specific legal sense of an entity of ownership within which resources are, in principle, common property, such as a corporation or a company. Sometimes, however, also cooperative ensembles that are only loosely or intermittently interdependent, or not interdependent at all, are subjected under the same ownership scheme. And conversely, cooperative work arrangements may involve partners belonging to different ownership schemes.

For the purpose of this discussion, it is sufficient to observe that, when facing the market, cooperative ensembles and clusters of cooperative ensembles adopt certain organizational forms that allow them to amass resources in order to obtain the competitive impact that is deemed necessary, sometimes in the form of informal networks of mutual obligations, sometimes in the form of contractual arrangements, sometimes in the form of firms, joint-ventures, etc. The important point in the context of this discussion is that the organizational forms adopted to meet the challenges of the market do not necessarily match the cooperative work arrangements, the work organization, not even the formal organization. That is, the different, super-imposed organizational formations are bounded differently and develop according to different demands and constraints.

CONCLUSIONS

In sum, *the organization* does not exist. The organization phenomenon is, rather, a complex of superimposed and interacting organizational formations (of which we, for our purpose, have discussed four). Further, there is no overarching conceptual scheme for the analysis of organization — and none is required. No single generative mechanism — not even a strong contender as Transaction Cost — can explain the formation of organizations in general nor the formation of firms.

However, conceiving of organization from the point of view of cooperative work provides a foundation for overcoming some of the weaknesses of the Transaction Cost approach — without abandoning the undeniable gains made by that school, in particular the dynamic approach to an understanding of the emergence of organizations and the specific gains such as opportunistic decision making and the relative costs of administrating the allocation of resources and the measurement and remuneration of performance. Conceiving of organization from the point of view of cooperative work also provides a foundation for distinguishing and relating multiple perspectives, which is needed in order to deal with phenomena of this order of complexity.

Some of the specific implications of conceiving of organization from the point of view of cooperative work are:

(1) There is no “common power to keep them all in awe”. The distributed activities and interactions of cooperative work are not and can not be controlled by a single will. The formal organization is merely a governance structure of certain aspects of the multifaceted realities of cooperative work.

(2) The organization of cooperative work is ‘open ended’. Irrespective of the perspective applied to organization, *the organizational boundary is contingent and porous*.

Having established this, let us then revert to the issue of computational representations of organizational context in CSCW systems.

A particular cooperative work arrangement is always situated in an organizational context. From the above analysis, it is evident that the organizational context of a cooperative work arrangement is a multi-faceted and open-ended phenomenon. That is, the organizational context can not be defined and bounded in any absolute sense, only relatively, with respect to a particular cooperative work arrangement. The organizational context of a cooperative work arrangement can thus be seen as a ‘field’ of dynamically varying intensity and density, thinning at the edges but seemingly without end: other intersecting arrangements, the enterprise, the division, the corporation, the network of suppliers and other collaborative partners, and customers, unions, banks, shareholders, and so on. This has radical implications for the design of systems supporting the representation of organizational context. We cannot assume that ‘the organization’ is a well bounded, closed, finite structure. What is within or beyond the organizational context is contingent, negotiable. We therefore cannot assume that content of the representation of organizational context or the classification schemes required to construct, maintain, and provide access to it are managed by a single center. They are, most likely, themselves constructed and maintained cooperatively [48]. Accordingly, in the design of CSCW systems supporting awareness of and access to representation of organizational context we need to address the issue of how to make the classification schemes for the management of common repositories amenable to be managed cooperatively in a ongoing process of distributed decision making.

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