

# Introduction

*The Modern Firm: Towards A New Paradigm* has one main arc and two major themes. We put forward the notion that existing approaches to the theory and practice of the firm are in need of a systemic overhaul. We propose a set of two alternative, multi-disciplinary suggestions that have the potential to enhance central features of and possibly replace the current paradigm. Our two major themes in support of wholesale change are *Systemic Cooperation* and *Organization*. These two function as umbrella concepts, generalizing agents' collaborative (inter-)actions (i.e., all processes, everything that agents do) in the firm as well as the encompassing organizational template (i.e., structure) within which agents operate. Consequently, the former notion focuses on forms of cooperation and collaboration in natural systems as well as human contexts; this also entails the intrinsic nature of both creativity and the motivation to be productive. In the latter case, we concentrate on self-organization with its decentralized control and coordination mechanisms, as evidenced by natural multi-agent systems, functioning as a fundamental alternative to the prevalent principal-agent hierarchy in the firm.

The inspiration for our inquiry comes from two sources. First, the dichotomy between Invisible Hand-type decentralized market dynamics (guided by the price mechanism) and the dictatorships of firms with their chain-of-command structures goes back to Coase's (1937) pivotal contribution. To us, the remarkable feature here is that decentralized market control and coordination are thought to be efficient for an economy as a whole while, at the same time, believed to be inapplicable to the firm where authoritarian principal-agent hierarchic control is allegedly of critical importance. Second, Singer's (2005) pithy discussion of the human brain's self-organizing, fully decentralized layout which he juxtaposes with the principal-agent hierarchies in human multi-agent systems provided the impetus to include natural science precedents in our discussion of the firm as a non-trivially self-organizing multi-agent system.

We believe that the divergence between self-organizing decentralized and principal-agent centralized formats continues to be not only of interest

but is, in fact, largely unexplained by Coase's transaction cost theory; transaction costs may explain why the firm is not a market, but do not explain why it specifically is a principal-agent hierarchy. We also find linked to this structural issue the tension between normative demands for the typical firm operating in the Knowledge Economy (this includes, for instance, efficient collaboration, high levels of motivation, engagement, individual as well as systemic creativity, innovation, and adaptive flexibility all the while being profitable), existing positive theories, and empirical evidence. Thus, while we do not necessarily agree with Aldous Huxley's (1946, Foreword to *Brave New World*) notion that a new type of (fictional) economics presented to the "Savage" as a "third alternative" would be "Henry-Georgian" and "politics Kropotkinesque," we nonetheless concur that the suggested focus on decentralist cooperation is neither "Utopian" nor "primitive" but rather offers the "possibility of sanity."

The background in front of which we operate is rooted in a generalist perspective. This incorporates the umbrella concept of naturalism (see: Papineau 2009) together with a biomimicry inclination (see: Benyus 2002). The idea is to turn to nature's precedent and scientific evidence in order to glean valuable insight into how this might benefit the firm as an open, complex multi-agent system. We, thus, see ourselves aligned with a pragmatist mindset (see: Hookway 2011) that embraces naturalism in the widest sense (i.e., meaningfully utilizing scientific knowledge) as well as a methodological non-reductionism which emphasizes "the context-dependence" (Brigandt and Love 2012) of any type of process. Specifically, we find that process philosophy (see: Rescher 2008) suits best our understanding of the firm as an open, complex, dynamically changing multi-agent system where creative work and innovation (i.e., multiple agents' constant dynamic change with action, interaction, and multiple interdependencies) as well as all other activities necessary to run a company. These actions are all processes.

We favor an, at the very least, analogous link between non-human and human processes and argue that we can derive valuable insights from long-lasting non-human natural processes for human multi-agent systems such as the firm.

"What is characteristically definitive of *process* philosophizing as a distinctive sector of philosophical tradition is not simply the commonplace recognition of natural process as the active initiator of what ex-

ists in nature, but an insistence on seeing process as constituting an essential aspect of everything that exists – a commitment to the fundamentally processual nature of the real. For the process philosopher is [...] one who holds that what exists in nature is not just originated and sustained by processes but is in fact ongoingly and inexorably *characterized* by them. On such a view, process is both pervasive in nature and fundamental for its understanding.” Rescher (2008).

We readily admit that we zigzag between the firm’s normative demands for the Knowledge Economy, existing theories of the firm, and empirical evidence. We also have to emphasize that we do not deliver blueprint-like management specifics. In part, this is rooted in our argument that human agents are autonomous, being intrinsically motivated and creative problem solvers who naturally tend towards pro- as opposed to antisocial behaviors. This, amongst other elements, strictly implies that myopic, micro-managing step-by-step rules and regulations with principal-agent hierarchic control and coercion tend to be not only unnecessary but downright counterproductive. The other reason why we, for now, steer clear of a model-type analysis is that a more detailed presentation would not only require substantially more space but also, crucially, would counteract our overall, generalist approach.

The downside here clearly is that we make ourselves vulnerable to at least three types of criticism. One, that it may remain opaque as to what the concrete implications for the firm would be. Two, that our broad-ranging, multi-disciplinary discussion might be unfittingly void of nuance. And three, that readers disagree with our assessment that the topics covered here are applicable to the firm in the first place.

### *Established Approaches*

We find established approaches to the firm to be based on methodological individualism in combination with a Hobbesian mindset in which humans are naturally selfish and cooperation is costly, nay nearly unfeasible, where prosocial behaviors like cooperation, altruistic helping, and collaboration require years of social conditioning, where both creative work and the motivation to be productive are essentially extrinsic, and where the principal-agent hierarchy is the standard organizational template.

In the first chapter, we begin with the prevailing paradigm and the appropriate assumptions underlying standard takes of the theory and practice of the firm. The Coasian (1937) dichotomy between decentralized free-markets organized by the Invisible Hand (which is closely related to non-trivial self-organization, see: e.g., Witt 1997) vs. the principal-agent hierarchic authoritarianism of the firm functions as the starting point. This is followed by brief summaries of standard economic approaches, somewhat off-mainstream evolutionary economic thought, and two examples from management/organization theory.

After this brief rundown of approaches to the firm we then focus the discussion on their underlying assumptions. That section is divided into three parts. In part one, we concentrate on methodological individualism. Part two highlights the, largely erroneous, premises concerning human behavioral traits (i.e., naturally exclusive selfishness) as well as cognitive and motivational characteristics (i.e., intrinsicness vs. extrinsicness). And in part three we complete what can be dubbed incomplete naturalism in that we point towards the firm's principal-agent hierarchy's literal unnaturalness and how that clashes with natural self-organization.

We conclude the first chapter by juxtaposing both normative demands as well as existing approaches' assumptions about the firm and its agents with empirical evidence. We do so mostly with an eye towards the principal-agent hierarchy's shortcomings when it comes to the coordination and control of multiple human agents and, with that, various (direct and indirect) cost factors (including reduced levels of motivation, creativity, engagement, and productivity). These are the exact opposite of what we would hope to find in the modern firm. The overall inference from our exposition in the first chapter is that established approaches to the firm are in need of a systemic revision.

Given that we discuss in the ensuing chapters the fundamentals of cooperation and collaboration (chapter two) as well as self-organization (chapter three) in the generalized form of parts-and-wholes, context-dependent structure-process dynamics in a number of fields that are *not* economics, management or organization theory, whenever we refer to processes we not only mean the specific processes at hand (e.g., in chemistry) but also automatically subsume all human agents' processes (i.e., actions & interactions) that are necessary when working within the encompassing structure of a firm. We, therefore, divide our discussion of the modern firm into two generalized components: processes driven by

systemic cooperation and the impact of organization. We also assume that aside from other specifications the basic goal of a firm is to operate profitably.

### *Systemic Cooperation*

In chapter two we turn to the first of two major alternative themes, *Systemic Cooperation*. The central premise is that forms of cooperation and collaboration are natural, widespread, of fundamental importance, and evolutionary beneficial. This stands in contrast to established positions with respect to the theory and practice of the firm, including of course, economic stances. As Akin, Hamlin, *et al.* (2012, p. e39211-1) note, “contrary to traditional economic theory that depicts human beings as fundamentally motivated by self-interest, people routinely engage in cooperative acts [...]. Indeed, human survival and flourishing have depended on our species’ ability to work together to achieve feats that could not be achieved alone [...].”

In addition to the human vantage point we suggest key ingredients for a systemic, naturalistic take on cooperation. This includes, in the first place, a more accurate rendering of evolutionary biological structures and processes, of which typical Neo-Darwinist Synthesis positions that are aligned with fairly narrow Social Darwinist interpretations (e.g., Hofstadter 1944/1992) have only a relatively small impact, especially when it comes to the processes of lasting novelty creation. In order to garner insight from natural systems so as to better understand human multi-agent systems we point towards the massive impact of non-random, context-dependent as well as, in the widest sense, cooperative and collaborative mechanisms part of Horizontal Gene Transfer (HGT) and various forms of symbiosis.

After biology’s natural science analogy we focus on human traits. One centrally important aspect consists of evolutionary real behavioral traits. Recent evidence convincingly shows that in addition to self-interest, the *Homo sapiens* comes naturally equipped with the capacities for altruistic helping, cooperation, collaboration, an emotion-based proximate mechanism of feeling happy when engaging in prosocial acts, and a sense of fairness (see: e.g., Warneken 2007, Haman, Warneken, *et al.* 2011 & Akin, Hamlin, *et al.* 2012). What is more, evolutionary anthropological evidence not only illustrates the evolutionary roots of altruistic helping

and cooperation in non-human primates, but because experiments work with very young children (i.e., 14 month-olds and, in the case of social psychology, even younger) who have barely been socialized, an evolutionary continuity component can be very well highlighted. This stance is further buttressed by evidence indicating that, for instance, intrinsically manifested altruistic helping in toddlers is in fact undermined by extrinsic material rewards (see: Warneken and Tomasello 2008). We then show that the Social Darwinist, Hobbesian *bellum omnium contra omnes* mindset is an attitude not backed-up by conclusive evidence for allegedly always at-war humans (see: e.g., Ferguson 2008). Overall, we demonstrate that the human condition is more likely than not defined by a spectrum of prosocial genetic traits including cooperation and altruistic helping, which runs counter to the established take.

We extend this position to the intrinsic nature of both creativity and the motivation to be productive. Comparable to the evidence for the undermining impact of extrinsic material rewards in the case of toddlers' preparedness to altruistically help, research strongly indicates that the same dynamic is at play when it comes to creative work and motivation/engagement (see: e.g., Deci, Koestner, *et al.* 1999). We discuss multifaceted creativity research, Gruber's evolving systems approach as well as the similarities between creative work and the motivation to be productive.

In the concluding section of chapter two we capture *Systemic Cooperation* by way of evolutionary and quantum games. For evolutionary game theory, we utilize the example presented by Worden and Levin (2007) who show that cooperative results can be substantially more easily achieved than standard versions hold. This is in line with a series of quantum game models. There the idea is, at least in part, that in order to test whether genes are indeed paradigmatically selfish (see: Dawkins 1999), quantum and not classical mechanics is applicable at these very small, molecular scales (see: Eisert and Wilkens 2000). Both, in this case and a more analogy driven quantum game application to agents' choice behavior (see: Pothos and Busemeyer 2009), findings strongly indicate that not only are the quantum game modeling results more in tune with agents' actually observed choice behavior but also that cooperation and not defection, is a consistently robust Pareto optimal Nash equilibrium.

Hence, the evidence discussed in chapter two demonstrates that necessary multi-agent cooperation and collaboration in the context of the firm

can be much more effortlessly realized than standard takes presume. Yet, what seems to us to be the foremost hindrance of viably efficient and effective cooperation and collaboration in the firm is its paradigmatic organizational template: the principal-agent hierarchy with the institutionalized power tournament. Consequently, we then turn to the matter of (natural) multi-agent system organization.

### *Organization*

Chapter three is all about self-organization as a proven, powerful alternative to the principal-agent hierarchy. Keeping in mind Coase's (1937) dichotomy between decentralized markets and the firm's authoritarian hierarchy with the underlying question why the former is typically considered to be functioning efficiently *because* of the absence of centralized control and coordination, while the latter is believed to strictly require dictatorial, chain-of-command oversight in order to be operational, we first consider re-discovered horizontal Web of Life (WOL) network notions in (evolutionary) biology. These stand in contrast to Darwin's vertical Tree of Life (TOL) renderings. The WOL is intimately linked to novelty-generating HGT and various forms of symbiosis and symbiotic mergers which we discuss in chapter two.

This is then followed by another natural sciences analogy, that of the complex parts-and-wholes, structure-process dynamics in chemistry. In contrast to both physics and biology, chemistry is to our knowledge very rarely employed in the social sciences (including economics), management or organization theory. Our main interest lies in the analogous treatment of parts like chemical substances (i.e., equivalent to human agents) and non-linear network-type multi-substance wholes (i.e., firms as multi-agent wholes) where chemistry's precedent functions as a primer for an improved understanding of complex, open system dynamics.

The next two parts of chapter three are then specifically devoted to self-organization. We focus on the pervasive impact of self-organization in natural, multi-agent systems from the smallest to largest scales. Defining self-organization as pattern or order formation in open, complex and stable yet far-from-equilibrium systems with fully decentralized, non-principal-agent hierarchic control and coordination we understand it to be akin to Smith's Invisible Hand and suggest a number of natural examples

for self-organizing multi-agent system as, at the very least, analogies for the firm as an open, complex multi-agent system itself.

We, thus, put forward a naturalistic extension of what McKelvey (1997) rightly classifies as “quasi-natural” self-organization when applied to existing modeling attempts in management and organization theories. The central problem there is that although the term *self-organization* is often employed in the context of the firm, the standard firm is, however, principal-agent hierarchically organized – the exact opposite of what structurally defines self-organization. After we, therefore, provide a detailed discussion of what self-organization looks like in natural systems, we conclude chapter three with a series of examples of how to non-trivially model self-organizing multi-agent systems.

### *Methodology & Implications*

In chapter four we bring together the two main strands of *Systemic Cooperation* and *Organization*. First, we deliver a fairly detailed exposition of a process philosophy-based methodology. We also establish two main process philosophy connections rooted in biology and the complex dynamics in chemistry. In addition, we also discuss a possible non-trivial application of quantum mechanics, that is, a quantum process philosophy. In order for this to be non-trivial in human multi-agent systems, one needs to demonstrate how quantum mechanics affects, say, our cerebral information processing (e.g., Penrose 1999). This is not as far-fetched as it may sound as, for instance, analogous treatments already exist in management theory (McKelvey 2002) and the social sciences (Wendt 2005), while recent research convincingly demonstrates a non-trivial quantum impact in complex organisms at normal temperatures (e.g., Mohseni, Rebentrost, *et al.* 2008) with Vedral (2011) emphasizing further aspects of “living in a quantum world.” The quantum facet of a process ontology can be quite naturally linked to the quantum game models we discuss in chapter two.

Another methodology component which happens to be under-researched, particularly in economics, is power. In the standard application, power refers to principal-agent hierarchic power which mostly means a principal having institutionalized *power over* an agent (see: Bartlett 1989 & Herrmann-Pillath 2004). Clearly, in the case of non-trivial self-organiza-

tion with no institutionalized principal-agent power to wield as all coordination and control efforts are non-principal-agent hierarchic, decentralized, fully agent-based, and allow for naturally emerging leaders without institutionalized power, the appropriate methodology needs to utilize a completely relational understanding of power. That, consequently, is what we do, mainly with the help of Krippendorff's (1995) take on power.

Subsequently, we provide a synopsis of how we understand the human agent, with self-interest, altruistic helping, cooperation, collaboration, a sense of fairness, creativity as well as the motivation to be productive all being naturally intrinsic. We then relate the individual agent to the firm as a self-organizing multi-agent whole and consider some implications for the theory and practice of the firm. We extend this analysis to the real world examples of *W.L. Gore & Associates* (our central precedent for a naturalistically, non-trivially self-organizing firm) as well as, very briefly, *real* democracy (Bryan 2005) and, in more detail, *Alcoholics Anonymous* (Zohar and Borkmann 1997).

We end chapter four with an appraisal of what it implies to interpret the firm as an *open* system. While both openness and complexity are standard assumptions in management and organization theory, the pragmatic implications are far from trivial. In synch with Herrmann-Pillath's (2006) collocation of the open society (Popper 1966) and the open firm, we indicate what it may entail to treat the firm as open system. A central implication being that unless there is a systemic organizational change, measures to, for instance, support women leaders, to employ allegedly advanced diversity and general management initiatives and so on, in standard firms will always face systemic opposition rooted in closed system hierarchies with their institutionalized power tournament. If one is truly invested in efficient change, the reforms have to be organizational and structural – they have to be systemic.

In the fifth and concluding chapter, we sum-up our suggestions for a novel take on the theory and practice of the firm. We also provide a set of proposals for future research, with a focus on methodology, systemic cooperation, and (self-)organization.