Abstract

Paradox may be the ground zero for disciplined speculation that forces individuals, organizations and societies to challenge normality and existing mental frames. Paradox can be a threat, and paradox can be a source for new insight. This paper examines how a paradox can emerge and develop in organizations. I will argue that the organization can be seen as a complex social system, and that the paradox rises as the system faces increased complexity in its environment, while equipped with an information processing architecture that reduces the complexity in an inadequate way. Following a review of classes of paradoxes: rhetorical, logical and social, the paper describes an organization as a complex social system with cognitive operations. The cognitive operations include drawing of distinctions, forming of categories, individuation of the system and the boundaries to the environment, and adaptability as a second order reorganization. The paper then discusses the dynamics and micro-foundation of how a paradox is formed based on this model. Three categories of social paradoxes: paradox of belonging, paradox of learning, and paradox of organizing, are analyzed and described as dynamic behavior in a system. The paper intends to inform a trans-disciplinary approach to describe phenomenon in organizations seen as complex social systems, and to contribute with conceptual understanding to be applied in empirical studies of paradoxical situations in organizations.

Introduction

The cognitive discomfort evoked by the phenomenon of a paradox provides a motivation to go back and resume business as usual, as if nothing happened. Only a few, usually philosophers at heart, like to revisit that edge, and wonder. These are the thinkers of which Kierkegaard wrote that the paradox is the source of their passion. We may think of the paradoxes as the atoms of philosophy, the basic point of departure for disciplined speculation. They challenge our compulsory universal beliefs; force us to see the symptoms of frailties in our reason, and to ask fundamental questions.

Paradox increasingly appears in organizational studies with a growing recognition that management and organization theory need to address the phenomenon that is inherent in human beings and their social systems. We need to confront the paradoxes. To seek what really happens in organizations as opposed to ‘what is supposed to happen’. Organizational theories attempt to capture a highly complex reality with finite internally consistent statements, which essentially are incomplete. Multiple scholars have claimed that exploration of paradoxes, with dynamic tension and balances, might move beyond oversimplified and polarized notions and stimulate development of more encompassing theories. The approach would need to embrace complexity,
diversity and ambiguity of organizational life as well as the complexity and ambiguity of the challenges in its environment.

Paradoxes come in all shapes and colors, and there are multiple meanings of the concept. On one hand, we have the logical paradoxes that are clearly defined, and have been subject to thorough analysis. Further, throughout history, we find paradoxes in the science of physics addressing real world observations. The paradoxes often lead to a crisis in the sciences, but later helped accelerate the main developments in physics, mathematics and philosophy. We find paradox in arts and aesthetics as thought provoking rhetoric to challenge existing frames of normality. Finally, we find the social paradoxes, where people in social systems experience counter intuitive and inconsistent feedback that appears to be interrelated, and simultaneously contradictory. The paradoxical experience may lead individuals and organizations to confusion and paralysis, or it may be a source for driving change and development. The first part of the paper will discuss the three overall categories of paradoxes: rhetorical paradoxes, logical paradoxes, and social paradoxes. Even though the primary interest lies in the social paradoxes, their basis in philosophy and logic will be used as a touchstone in our analysis.

There are two kinds of systems that display enough self-awareness to relate to paradox in a way described above: individual human minds, and human social systems. In this paper I will concentrate on social systems, as I am interested in understanding how organizations relate to paradoxical situations. We argue that every paradox, regardless of what disciplinary label it would normally wear, can be explained as a ‘glitch’ in cognitive operations of a complex adaptive system. The glitch happens when the system confronts areas of an increased environmental complexity, while constituted by a structure that reduces that complexity in an inadequate way. The paradoxical glitch results from the system’s own cognitive architecture unable to adapt to complexity in the environment. The second part of the paper presents an integrated theory of how organizations may be seen as social complex adaptive systems with cognitive operations of observation and coding of distinctions and categories.

The third part of this paper combines, our understanding of paradox, with the description of an organization as a complex adaptive system, to discuss how a paradox develops from the system’s exposure to increased complexity in its environment. I will develop a micro-foundation description of how different types of social paradoxes emerge and are resolved in complex social systems. I will study three categories of social paradoxes developed by Marianne Lewis in her extensive review of organization studies of paradox. The categories are (i) paradoxes of belonging, (ii) paradoxes of learning, and (iii) paradoxes of organizing.

What is a paradox?

The term ‘paradox’ stems from Greek \textit{paradoxos}, the adjective of \textit{paradoxon}. It means ‘contrary to expectation’, a combined word of \textit{para}, meaning ‘contrary’, and \textit{doxa} meaning ‘opinion’. The Merriam-Websters dictionary notes three meanings of the word – a paradox can be a statement that is seemingly contradictory or opposed to common sense and yet is perhaps true; a self-contradictory statement that at first seems true; or an argument that apparently derives self-contradictory conclusions by valid deduction from acceptable premises.

Rhetorical paradox
The rhetorical tradition used paradoxical statements actively to awaken the interest of the reader or listener, to challenge rigid truths, to enlarge the frames of understanding, or to prepare the grounds for innovation and creativity.

Zeno (490-430 b.c) was a pre-Socratic philosopher, most known for his paradoxes. Even though Zeno’s paradoxes were later subject to the study of both metaphysics, mathematics and logic, they were originally articulated as rhetorical paradox put forward to protect Parmenides’s theory on monoism where change is impossible. His rhetorical strategy was to utilize the paradox to reduce the question of change to something absurd and rationally impossible.

Rhetorical paradox was often intended to be amusing. In 1593 Anthony Munday writes a book ‘Defence of the Contraries’ with a collection of rhetorical paradoxes to the king where he excuses himself by saying that the book is intended ‘only as an exercise of wit, in difficult matters’. One might imagine that the real intention was to challenge and reframe the frames for accepted ways of thinking. Even though Munday’s paradoxes hardly demonstrated strict logical contradictions, they indirectly addressed the frames existing in common sense, and hence made it possible to focus and reframe accepted patterns of thinking.

Writers as William Shakespeare frequently used paradox not only to play with contradictions, but also to expand, challenge, or even disintegrate the individual and social belief systems that constituted his plays. As an example, in his play the Twelfth Night, duke Orsino exclaims, upon seeing the twins Viola and Sebastian, “one face, one voice, one habit, and two persons, / a natural perspective that is and is not!” John Keats called Shakespeare’s ability to create an ambivalence by incorporating two opposing values that are still somehow valid, a negative capability “that is when man is capable of being in uncertainties, mysteries, doubts, without any irritable reaching after fact and reason”.

During the nineteen and especially the twentieth century rhetorical paradox lost its role with the increasing development of formalism in mathematics and logic. Paradox was treated as something to be avoided and something that needed to be solved.

Logical paradox

The logical tradition tries to suppress paradox to avoid ontological distinctions of being and non-being to exist at the same time. This principle of contradiction is articulated in Aristotle’s Metaphysics and still stands as fundamental: a statement cannot be true and not true at the same time. It is known as the second of the so-called three classic laws of thought. Quine, a leading logician, has later classified paradoxes in three overall categories: a veridical paradox, a falsidical paradox, and an antinomy.

A veridical paradox is something that is strange but yet, surprisingly, true. Quine exemplifies this type with the paradox of Frederic, a protagonist of the ‘The Pirates of Penzance’ comic opera by W.S. Gilbert and A. Sullivan. Frederic is bound to be a pirate until his 21st birthday. However, being born on the 29th of February, at the age of 21 Frederic has only passed five birthdays. It turns out that he will have to be a pirate until he is in his eighties. Veridical means ‘truth-telling’: even though the statement at first appears to be absurd, it defends its logic when investigated more closely. As rare as it is, it is possible that ‘a man can be 4n years old on his nth birthday’. A paradox of this kind may lead to a discovery of a ‘buried premise of some preconception previously reckoned as central’, such as the premise that number of birthdays passed is a reliable indicator of someone’s age.

The falsidical paradox is ‘one whose proposition not only seems at first absurd, but also is false, there being a
fallacy in purported proof’7. There are many famous paradoxes in this category that have challenged science, philosophy, and mathematics throughout centuries. Quine’s example is the Barber’s Paradox, described by Bertrand Russell in 1918: in a village there is a man, a barber, who shaves all and only those men in the village that do not shave themselves. The question that brings the paradox alive is: does that barber shave himself? We cannot say so, because he shaves all and only those men that do not shave themselves. But we get in trouble also if we say that he does not, because he shaves all and only those men that do not shave themselves. To solve this paradox we must disprove the barber or the village. There is no such barber, or there is no such village. We need to conclude that an assumption, on which the paradox rests, is false.

Finally, there are antinomies. The oldest example of this type is the ancient paradox of Epimenides from Crete who said, ‘all Cretans are liars’. If he spoke the truth, he was lying, and if he was lying, he spoke the truth. Similar to the Barbers Paradox, there are loopholes to solve Epimenides’ paradox. If we reject that Epimenides were not always lying (maybe he occasionally told the truth), the paradox might be reduced to a falsidical paradox instead of an antinomy. However, in a refined and more abstract version, such as ‘this sentence is false’, a falsification through reduction ad absurdum is no longer possible: this sentence is true if and only if it is false. If subjected to accepted ways of reasoning, an antinomy produces a self-contradiction. In Quine’s characteristics it ‘packs a surprise that can be accommodated by nothing less than a repudiation of part of our conceptual heritage’7.

Social paradox

Social paradoxes tend to be looser than the logical paradoxes. The opposing terms are not logical contradictions, but rather in the form of tensions and oppositions between incompatible positions. Further, whereas logical paradoxes exist independent of time and in abstract thought, social paradoxes are subject to temporal and spatial constraints in the physical world4. Examples can be found on a cultural level in the western society where we currently find post-ideological paradoxes as (the drive for individualization): (the need to be part of something larger than ourselves); or a paradox of progress, i.e. (the more technology we develop to do our work): (the more technology actually controls our work and us). On an organizational level paradoxical situations emerge where individuals and groups with inherent dynamics are involved in tensions and reinforcing cycles at their very core. We try to build teams out of (individualistic) experts; trying to explore and innovate while exploiting resources to optimize; thinking globally while acting locally; fostering creativity while we increase efficiency; or trying to be in control when letting go of control seems to be working better.

In one way, paradox has become a modern cliché. The term is used whenever we have dilemmas or contradictory input from our environment. However, in organization and management research, there are a number of studies that analyze paradox in organizations to extrapolate the essence of different social paradoxes. M. Lewis reviewed the research of exemplars and derived three categories of paradoxes6. First, the paradoxes of belonging, that arises from the complex relationship between the individual and the others. In particular, the tension between the evolution and expression of individuality vs. the function and individuation of the group and its boundaries. Groups become strong and sustainable only if the individuality of their members is expressed, however, individual expression potentially initiate and fuels group conflicts, which provoke a feeling of inclusion and exclusion simultaneously11. Second, the paradoxes of learning, where the organization fail to recognize dramatic changes or increased complexity in its environment, and end up in contradictory and counter-intuitive situations. The current understanding, routines and structures are self-referential, relying and building upon themselves. They are a consequence of the organization interacting with the environment over time. The learning paradox rises in the struggle between the comfort of the past and the uncertainty of the future. Third, we have the paradoxes of organizing. ‘Paradox of organizing stress conflicting yet simultaneous demands for control and flexibility…(in) organizational performance, empowerment, and formalization’6. At the very core of
this paradox is the inherent tendency of self-organization in human systems vs. the underlying principle of planning and control in modern organizations. The paradox rise in the tension between planning, designed structures and control aimed at increased efficiency and precision, vs. the need for flexibility, adaptation and change on the other hand. The symptoms may appear as lack of empowerment, resistance, and confusion in the organization6.

**Complex cognizing systems**

Individuals experience paradox due to their cognitive abilities and self-awareness. The question then becomes, do social systems equally ‘experience’ a paradox? To understand how paradox appear in social systems, and what role ‘cognitive’ processes may play in it, we need an integrated theory of how organizations may be seen as a complex social system with a set of cognitive operations. Hence, we also need to address the question of what are the parts, interactions, and laws of interactions, which together form possible cognitive operations. In the following, I will develop such description based on existing theory of complex adaptive systems applied to social systems.

I will not equal cognitive operations in a social system with the cognitive system of the human mind. However, I will argue that there are collective cognitive processes performed by human organizations that exceed the mere aggregate of the cognitive activities performed by their individuals. Further, that social systems are themselves cognitive agents in their environment with a set of cognitive operations that shows resemblance of qualities in human cognition12. I will describe the cognitive operations of a social system in three parts. First, I will start at a broader understanding of cognition that we find in both complex human and social systems — the ongoing process of sense making. In cognitive science, the enactive cognition approach regards sense making as the primary cognitive operation13. Sense making is a primary observation of phenomenon in our environment, transformed into distinctions and the relationship between them. The distinctions and relations between them will gradually evolve into richer and more complex categories. Second, the ongoing sense-making process, coding phenomenon of the environment into categories held by the system, has been argued to initiate a general individuation process of the system14,15. Over time, the ongoing individuation process will evolve into boundaries between the system and its environment. Hence, both systems may be seen as closed and self-maintained relative to their environment (Luhmann, 1996). Finally, both human and social systems are adaptive and autopoietic, seeking to maintain a function and show a ‘willingness’ to survive16. Hence, both seek to preserve invariance and coherence in their operations related to their environment. Their cognitive processes are distributed in the system, and changes in their environment will initiate changes and reorganization of the interactions.

**Organizations as social complex systems**

The word complex stems from the latin word *complectre*, meaning to be entwined, twisted together, or weaved together. The word *system* has its origins from the Greek word *systema* and means a whole compounded by parts. From these two etymological definitions we understand that a complex system consists of parts that are connected so that it is difficult to separate them. The connection between the parts points to the interrelatedness of the parts. In an organization, the interrelationship implies interaction between individuals or between an individual and some other resource17,18. An organization can be seen as a social complex system of interactions; i.e. a set of connections in the form of a stable pattern of interactions between a variety of individuals19,17,20. What connects us to other people is action of communication, and what connects us to the physical resources is the action upon them and the communicating feedback we get.
When we see the organization as an emergent stable pattern of joint activity, we base our grounding ontology on (inter)action\textsuperscript{21}, and we stand in the tradition of process philosophy\textsuperscript{22-23}. Our model is based on change rather than on qualities of substance in the physical world. From such perspective, the organization is present in the becoming, rather than in the being. This is parallel to the ontological discussion from the ancient Greek philosophers debating whether the world is based on matter as described by the Atomists, or on change and action as promoted by Heraclites. The latter lead to process philosophy, influencing both theories of evolution\textsuperscript{25} and how complex systems of change can form stable structures\textsuperscript{24}.

From a complex systems perspective, the organization exists on multiple levels simultaneously. Each level integrates both constant change and stable structures. This is all dependent on the scale of perception. We can traverse through the multiple levels, from the perspective of the entire organization, to divisions, departments and teams. From close observations on any level we find constant change and patterns of (inter)actions. From a scale perspective above, the units at levels below appear as static and stable structures. From a corporate level, a department is referred to as a ‘unit’ with an input and output, however, a situated study from inside the department will report a myriad of activity and interaction between people. This is a natural property of structural hierarchies found in all complex systems\textsuperscript{26}.

### Boundaries of a social system

On the scale below the social group, we find the individual human being as the constituent part. The human individual is in itself a stable pattern of activity on a biological level of bodily systems, and an embodied mind that we may call a psychic system. The psychic system is on a qualitatively different level of scale; i.e. of biology rather than on a social level on which we aim to describe the organization. In the same manner, interactions of Carbon and Oxygen in molecules are on a level of physical systems, and therefore left out when aiming to describe biological systems. We may therefore see the psychic system to be external to the social system itself. The psychic system becomes a micro-environment for the social system, and following the theories of Nicholas Luhmann, we may say that there is a loose coupling between the psychic system and the social system\textsuperscript{20}. There are certainly mutual influence between the two, however, the interaction between individuals are part of the social system itself, whereas the activity in the human embodied mind is on a biological (psychological) level of scale in the structural hierarchy of reality.

On the other end of the scale of a multileveled hierarchy of an organization, we find the boundaries between the macro-environment and the organization. Implicit from our definition of a social complex system, we understand that this it not a physical boundary, and does not follow the topology of formal organizational structures. In line with the work of Nicholas Luhmann, we may say that the boundary is in its essence the shared distinctions and categories held by the system. The categories are created through a process where input from the environment is interpreted by a shared set of codes into patterns of interaction inside the system. The patterns are complex sets of (inter)actions that may take on stable forms upheld by continuous interaction, or as physical or digital structures. Hence, the boundary of the system becomes a ‘cognitive membrane’\textsuperscript{27} where challenges presented by the macro or micro environment evoke patterns of internal communication that are mapped into categories held by the social system.

### Distinctions and categories

The challenge from the macro environment will be any type of sign\textsuperscript{28} or reactant that the system is able to (re)act with\textsuperscript{21}. The (re)action constitutes the most basic type of operation whereby the system observes a difference.
The difference observed through the (re) action will introduce a new state in the system. This operation leads the way for the system to draw a distinction. The ability to draw a distinction is the fundamental cognitive operation of the social system. The distinction is the basis for all further development of categories. Distinctions are also the constituent part of the system’s boundary and ‘coding function’ between phenomenon observed in its environment into internal patterns of (inter) actions.

Following the theories of the mathematician Spencer Brown, we may think of distinctions as an abstract entity, a form, that separates a marked space from an imaginary unmarked space. We may say that the form has an ‘inside’ and an ‘outside’. Inside the form is the being; outside the form is the non-being. If we draw a simple form as for example a circle, we may refer to what is inside the circle (the being), and what is not inside the circle (the non-being). Similarly we may draw the distinction at the being of an object; e.g. a hammer/not a hammer.

By crossing the border between the inside and the outside, we enter the unmarked space to the outside of the form that becomes the non-being. Thereby the distinction being/non-being becomes specifiable. The inside of the form with its positive value of being, opens up for the possibility of attaching further observations and distinctions into thicker and more complex units of meaning. We may find that there are distinct different hammers (e.g. brick hammer, chasing hammer, sledgehammer), used in different contexts (e.g. chiseling bricks, shaping metal jewelry, destruction work). The inside of any distinction will open up for a possible new distinction to be made, and thereby introducing a new variety, a new state in the system. Further, the positive value of the distinction makes it possible for new connections to be made between new distinctions and actual existing distinctions.

When the system ‘reenters’ the operation of observation, now holding a particular distinction, it is called recursive. A recursive process uses the results of its own operations as the basis for further operations. Hence, what is undertaken is determined in part by what has occurred in earlier operations. The recursive process will act as a confirmation of consistency, where the states of the system that has been produced, serves as criteria for the acceptance and rejection of further operations.

If the produced output of the operation is confirmed, the distinction is confirmed. The product of a (re) action may be reactant in a new (re) action, and sets of reactions interacting with each other may form stable patterns. The patterns ‘condensate’ distinctions into a higher order unit of meaning, whose verification can no longer be obtained by a single operation. The recursive nature of the process means that the system reenters the operation under different situations, different times, and under different aspects. This leads to further enrichment and a condensed meaning. The stable structure is what in mathematics is called an eigen-value and corresponds with an attractor in the system.
In our example of the distinction ‘hammer’, the system may recursively draw new distinctions of different hammers with poly-contextual connective value. As a complex system of distinctions and connections, they form distinctions on a different level, indicating the general identity of a hammer (e.g. tool, often with a metal head, attached to a lever). This ‘super-distinction’ is what we may call a category. A category is a stable complex system of distinctions. The specific stable connections between distinctions in a category represent a set of constraints compared to all the possible connections that are not present. We may see a category, in fact any stable system, as constraints on variety (of the distinctions)\(^3\). The variety is given by the set of (inside) distinctions, and the constraints are given by the connections between distinctions made by the system. In our example, sledgehammer is connected to destruction, and not to jewelry, hence, there is a constraint on the actual connections versus all possible connections between the distinctions. The connection is strengthened by confirmation of the distinctions and connections in the recursive interaction between the system and environment. Hence, there is a natural complexification process with the two basic properties of evolution: variety and connection (selection).

The category as an emergent super-system will in itself draw a new type of distinction on the level below. The new distinction is the set of constraints on variety indicated by the category, and is drawn in the imaginary space of all possible constraints on variety. The outside of this form still represents possibilities in an unmarked space, e.g. connection between sledgehammer and chiseling bricks. The category is drawn upon the space spanned by the connections and variety of distinctions, which are internal states created by the system itself. Hence, they do not relate to the ontological distinction of being/non-being in the physical world. The system’s categories belong to a closed system ‘separated’ from the environment.

When the system draws a distinction on its own imaginary space of possibilities, it creates a boundary between the system and the environment. The categories belong to the closed system of (inter) actions that we may call a social system, distinguished from both the macro and micro environment. The distinction drawn by a category in the space of constraints, is a basic operation of self-observation; i.e. the system draws a distinction on itself. Forming of a category is therefore a first order self-observation.

Structural hierarchies form in complex systems\(^2\). New levels of categories as emergent super-systems will form and constrain the variety of the interconnected categories on the level below. For our simplistic example of the hammer, the initial distinction was drawn for a particular hammer in a particular context. With a recursive operation of the distinction at different times and contexts, the general category of a hammer is developed. The interrelatedness to other distinctions of tools and concrete activities may emerge into a category on the level above, for example of a trade; e.g. carpenter or blacksmith. Distinctions of identical activities and skills across trades may form an even more abstract category: competence. The categories are higher aggregated units of meaning held inside the system itself.

So far, I have discussed (inter) actions evoked in the system as a consequence of challenges presented by the macro-environment. However, challenges may also be introduced from the micro-environment, as a result of activity in an individual’s psychic system. From our argument, it follows that the distinction held by the individual is not the same as the distinction held by the social system. The output of the psychic system may result in an action (challenge), introduced into the social system, with a potential following (re) action. Just as for the challenges from the macro-environment this may initiate a process of drawing new distinctions, and confirming or rejecting actual distinctions.

**Dynamic categories**

Dynamic categories are meta-categories of a second order with the ability to alter the meaning of the categories
on the level below. The dynamic categories are a result of a complexification process where challenges in the environment introduce new variety. With additional variety, possible new connections increase exponentially. A category as a stable set of constraints on variety gives meaning for a particular environment. As the system is exposed to a more complex set of environments, different stable configurations of constraints may be possible. It may even be required in order to serve and maintain the function of the system. The same category may have slightly different configurations, and thereby meaning, dependent on the environment. The coevolution of categories will seek out new variations of constraints on variety; i.e. changing the internal structure of constraints.

The variations on the defining constraints are in itself a new type of variety. A second order distinction and variety is introduced in the system. We may call this a dynamic category, defined as a constrained variation on the categories. This may for consistency be defined as a constrained variation on (the constraints on variety). From this follows that the dynamic category is a category with the ability to alter it’s meaning by applying variation to the connections on the level below. The dynamic category still emerges from its sub-systems, but can by such process influence and alter its structure and, thus, meaning. This phenomenon found in complex systems is called a meta-system transition, proposed by Valentin Turchin, and further developed by Francis Heylighen.32,33.

The dynamic category becomes a second order observation of the system on it self. The dynamic category can ‘observe’ the system’s own categories by distinguishing between them, and by altering its own internal structure, change its meaning and identity. A new identity of a category may further have new connective value to other categories. The complexification process leads to (co) evolution of the structures of categories and to the systems ability to adapt to its environment.

**Adaptability**

Social systems are widely accepted to be of a class called Complex Adaptive Systems (CAS). In essence, complex adaptive systems adapt to changes in its environment to maintain fitness. Fitness of the system may be viewed both as functional fitness and structural fitness. Functional fitness is the ability of the system to perform a function in its environment including the ability to interact, utilize resources presented, and co-evolve with other systems. Structural fitness is the internal fitness relating to the robustness and strength of the connections between parts. The foundation behind a social system’s drive to seek fitness in its environment, and to uphold its function, is debated on the basis of Maturana and Varela’s concept of autopoiesis. Even though the original concept was introduced with reference to the phenomenon of biological life from an operational and temporal perspective, sociologists like Luhmann incorporated it later in his theories of social systems. The concept has proven to be useful to studies of social systems, and in particular developing its interdisciplinary character through systems theory.

Adaptation to environment may be seen from two perspectives. First, changes in the environment may introduce new variety of (re) actions and connections inside the system. With the introduction of variety and connections the complexity evolves incrementally to counteract and compensate for perturbations from the environment. This follows Ashby’s law of requisite variety, where the system needs at least the same variety of possible actions as the variety of challenges from the environment. Second, we may see changes in the environment that are too radical, too disruptive and of a dynamic nature where the system no longer can uphold its function with its present structure. The system itself needs to change its structure of interconnected categories, to reorganize, in order to support the continuity and coherence of the whole.

A real life paradox certainly may present a challenge of this magnitude. The system cannot only adapt incrementally to the situation. It must change its internal structure and architecture. New variety of actions must
form new stable patterns of categories held by the system. There is always a risk that the system is unable to find a new stable state and that it might become unstable and disintegrate.

Micro foundations of paradox experienced in social systems

With a description of an organization in terms of a social complex system, I am now ready to describe the foundations for a paradox experienced by a social system. I will utilize the three categories of social paradoxes as described above.

Paradox of belonging

All distinctions inherently contain a possible paradox. As we recall, every observation draws a distinction separating the being from the non-being. As long as we relate only to the positive value of being, new operations and connections are made. Once we try to observe both sides of the distinction at once, a paradox appears. This is an entity without any connective value. Non-being and being exist at the same time. This implies that all distinctions and knowledge is founded on a paradox where the world is split into two parts – the marked and unmarked. The unity of the two parts become a paradox, but unobservable to the system.

The epistemic tradition from Aristotle is based the ontology of being and non-being, and therefore the logical duality that follows of conjunction and disjunction. Objects in the physical world are distinguished apart from anything else. We can observe the hammer without having to refer to a screwdriver or a pair of pliers. This is the logical principle of ‘tertium non datur’ — something is, or is not, and it follows that the logical domain for this distinction is two-valued. From our description of a social system, we described how the system’s distinctions and categories are a particular configuration of the system itself, and hence, a closed set of interactions to the environment. Hence, a two-value distinction of the same phenomenon drawn by two different systems, may be the same but not identical. Here I utilize the established logical distinction between sameness and identity. For example the ‘hammer’ is the same category for two observing systems, however the true identity of the hammer is contingent on the contexturality of the observing system. ‘The ultimate identity is confined by the contexturality in which it originates’.

Categories held by the system are more complex structures of sub-categories (distinctions). A more complex category is often made with reference to another category: up/down, left/right, positive/negative, hot/cold. Hence, the more complex categories include forms that do not comply with the two-value logical domain of being/non-being. As discussed, the categories are internal forms constraining all possible states of the system, and are distributed and inherent in the system. For distributed systems many values are possible in the operations between categories. Gotthard Günther calls these operations transjunctions. Transjunctions are neither conjunctions nor disjunctions of being, but rather relative positive/negative distinctions made on a higher level of complexity. Transjunctional operations may accept or reject a connection between categories, and hence search for other connections or other distinctions to alter it.

This may lead to social paradoxes, and in particular a paradox of belonging. The categories and transjunctional operations have a specific identity and meaning in the social system. The polycontextural nature of the individual vs the social system means that the individual develops the same category, however not with the same identity. A specific situation revealing new complexity in the environment, can waken the paradox and make visible what was before invisible because of ‘sameness’ of the distinctions drawn by the systems.

We may use the example given above of Frederic in the Pirates of Penzance. The ’21st birthday’ acts as a
category of the social system of the pirate band; it has been formulated as an indenture of Frederic’s 
payeeship. For such a social system Frederic’s rare date of birth presented an opportunity – and the 
opportunity has been taken to attain a valuable human resource. The paradoxical situation occurs when the 
category ‘21st birthday’ held by the indenture in the pirate band ‘collides’ with the category ‘21st birthday’ held 
by Frederic in his psychic system. The categories are the same, however as they are confined by the 
contextuality in which they originate, they are not identical. The particular communication of the pirate band, 
the indenture, mapping a particular aspect of the band’s environment, a person’s age, is attempted unified with 
the expectation produced in another system, Frederic’s mind. The expectation had its merits, being based on 
experience of the mind witnessing operations of other social systems using the same system of language: where 
’21st birthday’ normally responds to ‘21 years old’. From Frederic’s point of view the transjunction between the 
two identities of the category ‘21st birthday’ must be rejected, even though the ontological question of their 
being would be accepted and confirmed by both systems respectively.

The veridical paradoxes between individual psychic systems and collective social systems happen when the 
meaning-processing components of social systems remain faithful to their ‘rules of production’ of categories; 
however surprising to the individual psychic systems, the identity of the categories are revealed as contradictory 
to the ‘same’ categories held by the individual. It does not feel right to people, but it is, nevertheless, consistent 
with the internal logic of the systems they construct. We can only imagine that there had been interactions 
between Frederic and other members of the pirate band about the indenture. The pattern of communication 
upheld the ‘sameness’ of the categories and only continued to make the paradox invisible. The new situation 
required the unity of the two identities of the category ‘21st birthday’, and so the paradox became visible.

Paradox of learning

A different class of organizational paradox, the learning paradox, emerges when beliefs or assumptions fail to 
keep up with the external changes. Beliefs and assumptions are formed through the recursive evolutionary 
process forming a complex system of categories, and the learning paradox emerges as a belief system is exposed 
to increased complexity in the environment.

Learning paradoxes emerge when organizations ignore dramatic changes in their environment, and lack ‘the 
ability to frame new knowledge within understandings, routines, and structures that enable actors to 
comprehend and adjust to variations’. The paradoxical tension reveals the need for learning, for reframing 
existing beliefs, and for the evolution of new sets of categories. Feedback from the environment might appear 
contradictory to the intended result of the action. There are a multitude of organizational studies of learning 
paradox. As an example, Lenoard-Barton, found that the more one focused on ‘core capabilities’, the more it 
would invoke their flip side, ‘core rigidness’. The inertia of the organization’s patterns of actions and routines 
were stronger than the ‘cognitive ability’ to adapt to a new category demanded by the environment. In another 
study, Philip Streatfield analyzed post merger integrations, and how existing understanding of the category 
‘managing’, hence ‘being in control’, lead to states of ‘not being in control’, whereas deliberate new strategies 
of ‘releasing control’ could lead to a state of ‘being in control’. The learning paradoxes fueled self-referential 
cycles with potential organizational paralysis and decline.

The first example of a learning paradox can be found 500 years b.c. when Hippasos, the follower of Phytagoras, 
studied geometry. The Phytagorean’s belief system was based on ratios of natural numbers. They would find the 
ratios governing structure in nature, in possible constructions, and in musical harmonies. The confirmation of 
the categories was so strong that the Phytagoreans thought of ratios and natural numbers as an expression of 
God and was linked to a divine experience. Hippasos’ discovery showed that the sides and diagonal of a square 
are incommensurable; i.e. it is impossible to measure the length of the diagonal in units of the sides of the
square. By this he brought the paradox to life — stating that the ratios of natural numbers (and a true divine proof of God’s existence), is impossible (and hence false) for any geometric figure with a square. Almost 2000 years passed before the paradox of Hippasos was resolved with irrational numbers, more specifically the discovery that the root of the number 2 is irrational.

The paradox of Hippasos was both a falsidical paradox and a learning paradox. It was falsidical since it was based on a false assumption that all numbers must be rational. What seemed to be an antinomy paradox turned out to be falsidical by eliminating the constraints on the category of numbers and of ratios. As Quine points out — ‘one man’s antinomy is another man’s falsidical paradox, give or take a couple of thousand years’ 7. Further, it was a learning paradox as the beliefs, and hence, epistemic categories had evolved inside a social system of the Phytagorean, and failed to keep up with new external discoveries. 2000 years of development makes it easy for us to see how the Phytagoreans had developed categories that were internal and ‘closed’ from reality, and that were ‘self maintained’ by their confirmation of nature through mathematics. Hippasos’s findings awakened the paradox by introducing a distinction based on increased complexity observed in geometry.

From our description of an organization as complex social systems, we remember that the social system was defined as a stable set of (inter) actions. The system would (re) act with challenges presented by the environment, further resulting in distinctions being drawn. Categories would emerge as stable super-systems of connected distinctions (constrained varieties of distinctions). The distinction (and category) is confirmed and strengthened through the system’s recursive (inter) action with its environment, and hence, the system interprets and codes the complexity of the environment into an internal system of categories with reduced complexity. The categories (as systems) are closed and self maintained which means that they are sustained as invariant structure in spite of a constant dynamic process of (re) actions. In formal reaction theory, it is possible to show that the category as a stable set of closed and self-maintained (re) actions, correlate with eigenvalues and attractors found in complex systems41. The attractor is a stationary regime of activity where the distinctions (and their strength) and connections between them have stabilized. The attractor is a sub set of the state space (set of all possible states of a complex system) that the system will evolve towards, and an attractor is often referred to as an equilibrium point for the system. In summary, a category acts as an attractor in the social system, and as part of a dynamic equilibrium of the system.

A complex system with an attractor can in principle be expressed as a set of formal statements (differential equations), where specific solutions are represented by functions describing the evolution of the system. As discussed above, the continuous process (complex set of reactions) upholding a category is of such nature. For illustrative purposes, I will describe the process as an interpretation function. The interpretation function takes challenges from the environment, that we will call signs (s), combined with existing categories (c) in the system, and returns a ‘state’ of recognition for the category. When the system recognizes the signs, and codes them into an existing category, the interpretation function I(s, c)=0 meaning that the category is stable and in an equilibrium. When signs from the environment changes, a new state is introduced in the system (category), the interpretation function returns a state where I(s,c)/=0. The category is not immediately recognized.

When the system is out of equilibrium, we may see two alternative developments. First, new variety of distinctions is introduced as new states in the system. Some connective value of the distinctions may be selected, thus constraining the variety. This may be the start of a new category evolving as described above. Second, we may see that the system tries to stay in homeostasis where it is ‘pulled back’ into the attractor and equilibrium of the category. The new signs/challenges from the environment is not forming a new category, but rather ‘enriches’ the existing category with more complexity. This will require the interpretation function (and hence indirectly the category) to change as the system recursively faces the set of altered challenges.

We may illustrate this in very simplistic terms, utilizing a phase plane method were we map the category as an attractor with the imaginary interpretation function I(s, c). The phase plane is the set of all possible states of a
A dynamical system is spanned by the state variables, a set of time, and a rule for evolution. The phase plane portrait is a graphical illustration where the possible trajectories of the system are mapped. For our simplistic example with an illustrative purpose, the two dimensional state space is spanned by the interpretation function $I(s, c)$ and the change in the interpretation function $dI/dt(s, c)$.

**Figure 1: Homeostasis, enriching the distinction**

In our first example, the system stays in homeostasis after the system (re)act with new challenges from the environment. Initially the interpretation function will return $I(s, c) \neq 0$ as the system encounter new challenges in the interaction with its environment, represented by the point $I_0$ (figure 1). The system’s (re)actions will start to change as a consequence and hence also the change in $I(s, c)$. We see this as an arc moving towards the center representing the equilibrium where the challenges are interpreted to ‘match’ the category. The new challenges are ‘integrated’ into the interpretation and mapping between challenge and category. The trajectory shows one potential evolution of the system towards a stable equilibrium. The equilibrium is reinstated when the interpretative coding function comes back with $I(s, c)=0$ and the change in categories and the interpretation function will come to a halt.

If we follow the same line of reasoning, we may see how a paradox emerges (figure 2 a, b). Let’s assume again that the system is exposed to new challenges from the environment that leads to a new state $I_0$. Again the system (and the interpretation function) changes following a trajectory in the state space. Following the trajectory from $I_0$ we see that $I(s, c)$ changes and tries to adapt, however, unable to reach the equilibrium in $I_1$. Rather, at point $I_1$, we see that the interpretation of the challenges map the category in the system, however, the momentum of change is at its maximum. The system must follow a trajectory in state space and in our example below approaches $I_2$, the other side and the ‘antithesis’, of the state at $I_0$. Since the state of $I(s, c)$ is now at its maximum distance from the equilibrium, however in the opposite direction, the process starts again. The coding function and categories are changing gradually to the other side again.

**Figure 2a, 2b: Paradox and spiraling dialectics**

We may see two potential patterns that both are well documented behavior of complex systems; i.e. a spiral trajectory back to the equilibrium, or a limit cycle that would constitute the paradox. For the spiraling trajectory, the system will gradually dampen the paradox. We find this behavior of systems in Hegelitarian dialectics where the thesis, antithesis and synthesis evolves back to an equilibrium where balance is found and where new challenges in the environment has brought new complexity and quality to the category. The equilibrium and attractor of the system has also evolved, however, not depicted in our simplistic illustration below.

The other possibility is that the system remains to oscillate in a perpetual movement in a limit cycle around the attractor. The system has a paradoxical experience as the state of the ‘thesis’ consequently brings it into the state of the ‘antithesis’. Hence, the organization’s own belief system, based on its own categories, appears to be inconsistent and directly contradictory. As we see, this is a time dependent evolution in the system’s own state.
space that is closed and self maintained. The system is not experiencing any ontological paradox in the environment, but rather, is exposed to increased complexity from the environment leading to limit cycles in its own system of categories.

We see how the learning paradoxes of Lenoard-Barton and Phillip Streatfield (introduced above) can be described in this model. In both examples the organization was exposed to increased complexity in the environment. The complexity of a merger between two corporations challenged the category of ‘management’, ‘being in control’; in the other example, the strive for competitive advantage required a redefinition of the category ‘competence’ into a more subtle distinction of ‘core competence’. By applying ‘management being in control’ (the existing category of control held by the organization) there was a feeling of ‘not being in control’, and ‘not being in control’ (letting go of ‘control’) would lead back to a notion of ‘being in control’. Similarly, the focus on ‘core competence’ would lead to ‘rigidness’, contradictory to the intention to gain competitive advantage through increased flexibility of combined specialized competence. In both situations the application of existing categories to the environment of increased complexity, resulted in new states of the systems that appeared. By observing the difference, however, upholding existing patterns of (inter)actions, routines and structures, the organization arrived a contradictory state. The recursive observation of the ‘difference’ with the continuous inertia of existing patterns of (inter) action lead to a limit cycle in the system’s own state space.

Since, learning paradoxes are based on non-valid categories, they are by reason falsidical paradoxes in logics. Hence, the paradoxes are resolved, either by an evolution of categories to integrate increased complexity, or to reject the category. In the example of Hippasos, the category of ‘numbers’ was eventually expanded to include irrational numbers, a more complex category that could map the challenge of commensurability between the sides and the diagonal. Simultaneously, the category of ‘God’ as ‘ratios of natural numbers’ has been rejected, hence, solving the paradox. In the literature of exemplars, multiple methods of resolving learning paradox have been proposed that resonates with the understanding that might be derived from the description above (Lewis, 2000).

**Paradox of organizing**

In the last two sections we could see how the paradox of belonging correlates with the class of veridical paradoxes in logic, and that the learning paradox correlates with the falsidical paradoxes. What the paradoxes of belonging and paradoxes of learning have in common, is the foundation in the system’s own internal structure of categories. It is the system’s ‘epistemic’ interpretation of the environment to its own closed and self maintained system of categories that creates the paradoxical experience.

For the last class of social paradoxes, the paradox of organizing, this is slightly different. The paradox stems from the very nature of two types of organizing; i.e. the self-organization, and the designed structured organization. The self-organization is based purely on (inter) actions in the social system. The individuals choose to interact to achieve their own and common interests, and the evolving system is a product of selection and fitness between them. The social ordering, and hence the organization, emerges with structural properties that channel individual activity. The individuals are free, purposeful agents, yet the organizational social structure constrains their actions. Actions will facilitate structure; structure will facilitate actions.
In a formally designed organization, the structure is constituted by power of authority, hierarchy, shared rules, and physical infrastructure as buildings and networks. Traditionally, the ontological assumptions about organizational structures, are that they are concrete objects. However, based on fundamental action ontology they might just as well be stable structures (i.e. systems) of actions. It would for example be just as legitimate to argue that a database held in a computer system is based on (inter) actions of electrical current, referred to as bits and bytes, as it is a matter of substance.

In self-organizing systems, control upholding its function and coherence is inherent and distributed in the system itself. In a designed organizational structure, the management acts as the controller. The management will, based on the owner’s intention, design and seek to enforce structures in the organization. The management’s communicative action would either introduce distinctions, or enforce connections between agents, hence constraining the total potential variety; — ‘the very action(s) of organizing involve the drawing of distinctions; organization itself is a source of tension’. We end up with two types of categories (distinctions) in the system. On one hand, the categories imposed by the management, conceived in their smaller system of the management team or in the psychic system of an individual, and expressed as communication in the organization. On the other hand, categories held by the organization as a result of interaction with the environment where observations lead to patterns of communicative (inter) actions.

Under stable conditions, formal organizing categories and categories of self-organization are complimentary, in equilibrium, and part of a complex structural hierarchy. For example in traditional industrial production, the core management principle was to reduce cost per unit by division and specialization of work. Complex tasks were broken down into sub-tasks by a classic Newtonian method. The self-organization would appear as ‘niches’ in the formal structure, where individuals came together to interact. Routines as stable patterns of interaction would emerge, and both formal capabilities and informal social structures would evolve.

The industrial model was challenged by more complex demands from the environment. The established frame that customers want the mass-produced and cheapest product changed. Instead there was a demand for individualized products, bespoke to specific requirements, accompanied by a set of services; while still requiring that the price remained low. We know that new organizing management principles were needed and introduced. Examples may be: modularization; flexibility and speed in reconfiguration of production lines; self organizing teams; lean production; total quality management; just in time delivery models; service as a product, etc. The development would accentuate opposing forces coexisting within the existing formal structure of the organization. The existing frame would promote efficiency and cost reduction through exploitation of resources, while the new paradigm would require additional flexibility and innovation through exploration. The principles of lean production, TQM, and just in time delivery models, would encourage the employee’s discretion and problem solving, while at the same time require new and more extensive systems of monitoring and statistical control.

Hence, the paradox of organizing has elements of both paradox of belonging and paradox of learning as described above. First, there is a ‘collision’ between categories from different systems similar to a paradox of belonging. The categories of management originate inside the system of management, and while communicated and agreed, the organization does not necessarily hold the same meaning in the (inter) action based self-organized system. The categories are the same, however, not identical. New challenges in the environment might awaken the differences and hence the paradox. Recently, I witnessed such paradox in a larger organization in the oil and gas industry. In the present crisis in the industry (2016), new delivery models are needed and existing methods are challenged. The category in question was ‘the management system’, and whether it is a representation, and an aggregated description of how the organization work; or if it is a prescriptive process of how the organization should work. Fundamental, questions regarding the category of ‘a management system’ resulted in tension and paradoxical ‘loops’ in the argument. The previous decade of stable...
growth and condition in the industry had created equilibrium, where the category held by the systems was the ‘same’, however not ‘identical’.

Second, we also find elements of a learning paradox. The environment appears with new challenges and complexity that are observed by the system. The system is unable to process new challenges into existing categories, and enters into a limit cycle in its own internal system of categories. In our example above the category of ‘mass-produced’ correlated with an organizing principle of ‘cost efficiency, scale and repetition’, whereas ‘customized’ would require ‘bespoke solutions and dedication to the individual customer’. With more complex demands from the market, the category ‘mass-produced’ evolved into ‘mass produced and customized’. The organizational actions, routines and structures would need to change to incorporate new organizational principles that could integrate ‘cost efficiency with flexibility and change’. New and more complex systems of categories are needed that can ‘absorb’ the contradictions, and create the necessary new distinction with new connective value, enabling the system to proceed. In our example of the mass vs. customized production, such category may for example have been ‘modularity’. Modularity has enabled standardization of smaller building blocks while emphasizing the possible number of combinations that promotes the uniqueness of the whole. Hence, the paradox of organizing is the social equivalence of the antimony paradox of the logical paradoxes. It requires the system, not only to adapt its categories, however also to change its internal architecture of cognitive processing. New dimensions and degrees of freedom in the imaginary space of categories are needed.

Summary

The present paper has proposed to describe organizations as complex social systems with cognitive operations to understand how social paradoxes emerge. The cognitive processes are limited compared to the psychic system of the individual human being. By defining the organizations based on action ontology, we were able to utilize theory of complex systems to describe cognitive operations of the social system. We discussed how the system interacts with challenges presented by the environment, and how change in the system’s state results in distinctions being drawn. Categories would emerge as stable super-systems of connected distinctions. The categories are confirmed and strengthened through the system’s recursive (inter) action with its environment, so that the system interprets and codes the complexity of the environment into an internal system of categories with reduced complexity. Finally we discussed how, the categories are closed and self-maintained, sustained as invariant structure in spite of a constant dynamic process of (re) actions, and act as attractors in the system.

With the model of an organization as an action-based complex social system at hand, we could study the three categories of social paradoxes: paradox of belonging, paradox of learning and paradox of organizing. Each type of social paradox was described through the integrated model of a complex social system and through real-life examples. Comparisons and parallels were drawn to the logical and philosophical paradox. We were able to see how the social paradoxes arise as the organizations encounter increased environmental complexity, while equipped with an information processing architecture, which reduces that complexity in an inadequate way. We concluded that paradox is a result of a social system’s cognitive adaptation process.

The paradox will not resolve from a repetitive, more focused, or a more comprehensive processing done by the same system architecture. The system needs to alter and reorganize its set of categories to process aspects of the environment that are not being related to appropriately. This may include enrichment and altering of ‘false’ categories, or it may involve reorganization of the internal structure of the cognitive operations of the system. This will include cognitive operations by the system, on the system itself.

Our hyper competitive and dynamic environment will continue to evoke paradoxical situations in organizations with equally increasing intricacy, ambiguity and diversity. Much of contemporary organizational theory is still
struggling to live with, and moreover understand, paradoxes. I have argued that a trans-disciplinary approach of complex systems theory, theory of evolution, and cognitive science, may contribute to understand the dynamics of paradox in organizations. Further, I hope that practitioners may find support in theoretical distinct concepts in helping them translate principles of management and organizing into real-life organizations.

References


