Metanoia and Aporias: Linking Systems Thinking with Yin/Yang Daoism

Thomas Vlk

Technical University Graz
Rechbauerstrasse 12
A 8010 Graz, Austria

tvlk@ist.tugraz.at

Günther Ossimitz

University of Klagenfurt
Universitätsstraße 65
A.9020 Klagenfurt, Austria

guenther.ossimitz@uni-klu.ac.at

Abstract[1]

Straightforward or 'linear' thinking in the form of simple cause-and-effect approaches, based on bivalent logic, has been elaborated for centuries particularly in the Western Hemisphere. This concept has its limitations in grasping situations, which are beyond binary yes-no-logic. The systems concept of Aporias (aporetic conflicts) and the eastern daoistic Yin/Yang philosophy are two ways which allow to go beyond the realm of simple true-false logic and to handle conflicts and systems requirements, which are beyond the scope of logical or hierarchical governance. Despite of different origins, Aporias and Yin/Yang have similarities in their capability to go beyond the world of logic. The key for achieving success is in our opinion Metanoia – the readiness to change one owns mind radically.

Keywords

Aporia, Yin/Yang, Daoism, Systems Thinking, Systems Acting, Metanoia, System-Archetypes

1. Introduction

In this paper we will try to give an overview of some fundamental aspects of modern systems thinking. We will show that some of these concepts have relations to some ancient principles the traditional Chinese philosophy of Daoism (Taoism[2]).

We will use Radical Constructivism, as developed by Ernst von Glasersfeld, Heinz von Foerster and Paul Watzlawick, as an epistemological framework. This will allow us to accept both western logic and daoistic concepts as different mental models or constructs.

We will compare western logic and Daoism on how (differently and yet similar) these concepts are dealing with aporetic conflicts or Aporias. Aporetic conflicts are characterized by the fact that both sides of a conflict are right and dependent to each other. In a world of strict bivalent (true-false) logic it is impossible that two opposing positions both can be true. Thus Aporias are outside of our western binary logic.

In Daoism the mutual dependence of opposing positions or forces is well established in the concept of Yin/Yang. So Aporias have a natural appearance in a daoistic context. Under a systemic perspective we will see that Aporias are essential for understanding many systems – especially in the socio-economic realm. So we can argue that concepts of Daoism are helpful to extend our western true-false-logic in order to understand social and economic systems better.

For people raised in the Western hemisphere it is often not so simple to understand ideas and concepts of ancient Chinese Philosophy written in books about several hundred years ago. So we hope that the readers will follow the next sections with some generosity.

2. Limits of straightforward Thinking

Logical thinking has proven to be a fertile concept for hundreds of years and bringing wealth to whole societies – especially in the western hemisphere. It is characterized by a simple true-wrong logic and strict if-then causalities. Yet such straightforward, one directional thinking in pure cause-and-effect relations, disregarding feedback loops will often lead to "quick and dirty solutions" in the sense of Peter Senge [2006] or "first order change" in the sense of Paul Watzlawick [1974]. Watzlawick means by first-order change a change within a limited scope, just increasing the amount of the symptom-cure if the chosen solution does not prove to be efficient in the long run. A simple

[1] The preparation and presentation of this paper was supported by the International Federation for Systems Research.

[2] The romanization from Chinese is debated controversially. The term Taoism is used in the older Wade-Giles-System; Daoism in the modern Pinyin-transcription system.

example would be taking some Aspirin in the case of toothache and increasing the dose of Aspirin if the toothache gets more severe. A second order change would require a visit at the dentist in order to cure the cause of the pain and not just to get rid of the symptoms by taking some drugs.

According to Gerhard Schwarz [2006] this approach can roughly be founded on four principles of Aristotelian logic:

- Law of Identity
- Principle of Bivalence
- Principle of Contradiction
- Law of the Excluded Middle

The Law of Identity simply states that every item is identical to itself: A=A. The Principle of Bivalence says that every proposition is either true or false. The Principle of Contradiction says that two contradicting propositions cannot both be true. The Law of the Excluded Middle is also known under the latin formulation "tertium non datur": either a proposition or its negation is true – there is no third possibility.

These axioms of logic have brought a variety of tangible implications. They are the basis of a special mode of thinking: thinking in pure true-false-relations and strict cause-and-effect chains via logical reasoning. This mode of thinking has an massive impact on everyday life in the Western hemisphere: technical inventions, scientific research, computer technology, cutting-edge medicine, jurisdiction are embedded in this form of thinking – on the hunt for breaking problems down into detailed solutions.

Yet this strict logical approach to manage our world has considerable drawbacks, as the following examples will show.

Jurisdiction: Considering the conflict theory of Gerhard Schwarz [2009], jurisdiction is associated to the fourth level of conflict solving – delegation to a higher instance. To make it work there are needed: a) two parties which are of different opinion about a case; b) a judge who has the wisdom to decide the case correctly and the power to enforce his judgment; and c) the judges decision is respected by the two opposing parties. There is however another subject which has to be taken into account. In order to allow the judge to make a correct decision it is necessary that one of the parties is right and the other is wrong. In aporetic cases – where both parties are right – a judge cannot serve for resolving the case. In such cases mediation is much more suitable.

Why does mediation has a far higher success quota on sustainable problem-solving? Because it neglects the "logic" fact that if one is right, the other is wrong. This canceling of the Law of Contradiction enables a new set of possible decisions leaving both parties satisfied with the outcome.

According to Staub [2006] many US states have introduced a mandatory mediation before couples can go to court in the case of divorce. Surveys show that 50-75% of the clients can reach an agreement and 60-90% are satisfied with the achieved results (compared to 40-50% in court). An indicator for the better addressing of the underlying conflicts is that even when clients were forced to mediation, more results lead to a split and far less ended up in court again.

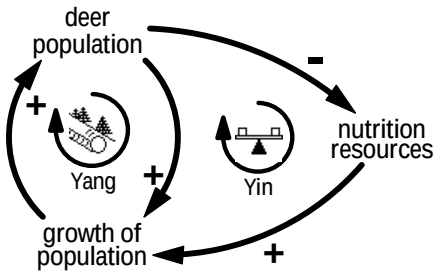
Management: The psychologist Dietrich Dörner [1989, 1997] provides a wonderful example of the application of first-order change. Two managers were asked to plan the improvement of the living conditions of the Moros, which is a tribe in the Sahel-Zone. The living conditions of the Moros were quite bad, suffering from the Tse-Tse fly, which causes the human sleeping sickness and the similar nagana sickness in cattle. The managers decided to fight the Tse-Tse-fly and thus both Moros and their cattle did flourish. More water was needed for the people and the cattle, so more and deeper wells were dug. This eventually resulted in the completely exhaustion of the ground-water reserves. The grass went dry and the cattle began to eat the roots of grass, thus destroying the basis of their food-supply. After a short period of time of being better-off the Moros eventually ended up much worse than before the "development" induced by the managers. Fortunately this scenario reported by Dörner was just the behavior of the managers in an experimental computer simulated planning game. What went wrong? The managers tried to solve the apparently obvious problems according to their perception, neglecting the responses of the system to their actions (more need of water for cattle, exploitation of ground water reserves), which form systemically feedback-loops with some time-delays. One of the main findings of Dörner and other cognitive psychologists on complex problem solving was that people think just in simple cause-effect relations, having sincere problems to grasp the responses of the system to their decisions – even if these are evident from the very beginning: more cattle needs more grass, this needs more irrigation.

Economy: Why do economies grow? Our economic system has apparently an "intrinsic" tendency for permanent growth. Romer [1990] explains in his model of endogenous technical growth that it is the technical development which boosts the growth of the economy. Apart from Romer's explanation we see a core reason for the necessity of permanent growth in the monetary or financial system, which is based on lending money for interest. In order to gain the interest, economic growth is inevitable on a macro-scale.

Systems with permanent growth meet the system-archetype "limits of growth". The systemic dilemma is that no system can grow forever. Ossimitz and Lapp [2006] put it in a clear statement: "A system, that is coercively forced to permanent growth, cannot exist sustainably, but eventually leads to its own downfall." So the tendency of a system to grow forever generates its own doom.

A less dramatic variant we encounter in Peter Senge's [2006] system-archetype of "limits of growth", which starts with a phase of growth, that is overruled by stabilizing feedback forces in the long run.

Fig 1: Limits of Growth-Archetype



As an example in Fig. 1 a deer population is growing, since the nutrition resources are abundant in the initial phase. This growth is driven by the escalating feedback loop on the left. After some time of growth the nutrition resources of the deer population becomes a limiting factor and in the long run the growth of the population will cease and the population will (hopefully remain on a stable level. Senge [2006] says: "A reinforcing (amplifying) process is set in motion to produce a desired result. It creates a spiral of success but also creates inadvertent secondary effects (manifested in a balancing process) which eventually slow down the success."

Interestingly parts of the human society, namely the government on one side and the people on the other side experience the growth factors and what leads to growth as "positive" and "desirable"; whereas the stabilizing factors are encountered as "negative" and "bothersome". However those stabilizing factors actually keep the system alive in the long run. The management principle of how to address this problem is given by Senge [2006]: "Don't push growth; remove the factors limiting growth". To weaken the stabilizing factors however will eventually lead to a more escalating cycle, where stabilizing processes are perceived as shocks.

These three examples from jurisdiction, management and economy show that straightforward thinking concepts based on true-false-logic and plain linking of cause and effects and primitive "the more the better" concepts are neglecting essential features of systems: feedback loops, limits of growth etc., which makes them not as efficient as systems approaches.

3. Systems Thinking

We will discuss two major approaches to go beyond simple straightforward thinking: Systems Thinking and the Yin/Yang-concept of Daoism. It will turn out that both ways have some similarities – despite of their completely different appearance. Both ways offer concepts to deal with situations beyond simple cause-effect relations and beyond simple true-false-logic. In Systems Thinking the key are strategies to deal with aporetic situations – which are not even thinkable in the world of strict bivalent logic. In Daoism one of the key concepts will be the interplay of antipodes in Yin and Yang.

Systems thinking and acting following the concept of Ossimitz [Ossimitz 1998, Ossimitz and Lapp 2006] consists of four dimensions:

- Thinking in networks and feedback loops
- Understanding of time-dynamics
- Thinking in models
- System-oriented acting

Both Peter Senge [2006] and Ossimitz and Lapp [2006] stress that Systems Thinking is based upon a certain habit they call Metanoia, which means the readiness for a radical/fundamental change of mind. They argue that without Metanoia people are limited to first order solutions, which do not help much in changing systems structures and systems behavior. Particularly accepting aporetic constellations requires the readiness for thinking in completely new ways. So it is of not much help just to add models, constructs, and techniques to one's repertoire. The key to this is not to add new ideas, but to diminish the ineffective old ones:

"In the pursuit of learning one does more day by day; in the pursuit of the way one does less every day. One does less and less until one does nothing at all, and when one does nothing at all there is nothing that is undone." [Lau, 1963]

This does not mean to throw away all useful ways of acting, which have proven their value for certain situations. It means to remove all concepts of thinking which we think are effective but are not if evaluated on their results. An ambitious goal might be to develop two "brains": one for logic thinking and one for "aporetic thinking". Yet we have to take into account that this separation is artificial and a typical western point of view. Maybe we better should try to allow our brain an interplay between logic and a mode of thinking, that allows to embrace conflicting or aporetic viewpoints at the same time.

We think that it is not feasible to try to address the same issue with both approaches at the same time. Each approach forms a specific paradigm – a perception-paradigm. Yet a system or a situation can be looked at in a kind of process using different paradigms one after the other. The advantage of this conception lies in the following: When we can think separately both in a logic and in an aporetic way, a holistic approach may emerge on its own, although both ways of thinking are clearly separated in advance.

In our opinion a key for attaining this integrated ability of thinking is to start with logical thinking and systems thinking as two distinct paradigms. When people try to learn new concepts, they tend to bring all

ways of thinking together; We see a failure in systems thinking not primarily as a matter of open-mindedness, but as a matter of the ability to separate different modes of thinking at first.

The mere thinking aspect of Systems thinking is just one part of the whole concept. The other core aspect is systems-oriented action. In the definition of Ossimitz and Lapp [2006] the fourth dimension is related to systems-oriented acting. Also Peter Senge's work on systems thinking is full of practical aspects, e.g. in Senge's Fieldbook on Systems Thinking. [Senge et al. 1994]. The Italian psychologist Giulio Cesare Giacobbe [2005] puts it even more drastically: For Giacobbe *any* thinking is a valuable tool if and only if it leads directly to any form of acting.

4. Aporetic Conflicts

In our opinion the concept of aporetic conflicts (or Aporias in short) is essential for understanding social and economical systems. The modern definition of the ancient philosophical term ἀπορία (greek: no way out) has been coined by Gerhard Schwarz: An aporetic conflict or Aporia is a situation which fulfills three criteria: (1) Two opposing positions (which is trivially true for every conflict) (2) *Both* sides are right (this implies that Aporias are outside classical logic) and (3) both sides depend on each other: no side can exist without the other. The combination of all three criterions make Aporias so tricky. Criterion (1) implies that they are uncomfortable and annoying; criterion (2) implies that they cannot be resolved either by logical reasoning (since they are impossible and not allowed in the world of logic) nor by judges or hierarchical organizations[3]. Criterion (3) implies that there is no way out of the Aporia: the two parties can neither destroy each other nor leave the other side alone, since this would destroy their own existence, since they depend existentially from each other. Ossimitz and Lapp [2006] sum up: "Aporias are apparently logically impossible – nevertheless they occur quite often in practical life".

A good example for a Aporia in a nutshell is the "quarrelling couple", originally described by Paul Watzlawick [Watzlawick et al. 1967]. A couple has marital problems to which he contributes passive withdrawal, while her part consists of nagging criticism. From his point of view withdrawal is the reaction on her nagging, while she claims just to criticize because of his withdrawal. Thus their quarrel consists of a monotonous exchange of the messages: "I withdraw because you nag" and "I nag because you withdraw." They perceive their own behavior as an reaction to the other's behavior. Systemically their communication forms an escalating loop. Considering the type of conflict, we see an Aporia: (1) there are two opposing positions (2) both sides are right (from their personal viewpoint), and (3) both depend on each other. His position depends on her nagging, her nagging depends on his withdrawal.

[3] Gerhard Schwarz [2005] argues in some detail that hierarchies and hierarchical organizations are formed according to principles similar to the axioms of classical logic.

5. Yin/Yang-Thinking in Daoism

The daoistic model of Yin/Yang is the basic concept of thinking in the Eastern hemisphere. System-theoretically spoken Yin and Yang are two placeholders, variables for any polarity in general and aporetic construct in particular. To get a first rough idea the Yin/Yang-Model can be compared with the examples of Aporia given in Table 1:

Table 1: Yin/Yang and Aporias

Yin	Yang
elder	youth
individual	society
dead	living
women	men
peace	war

Interestingly the first four polarities of Yin/Yang are counted as the four fundamental Aporias by Gerhard Schwarz [2009]. In eastern philosophy Yin and Yang are two polar forces which form the cosmos in their interaction. This thinking and perception of a dualistic world probably dates back to 3000-2000 B.C. Using Yin/Yang as placeholders following table can be drawn [see Elleberger, 1995]:

Table 2: Yin/Yang examples

Yin	Yang
earth	heaven
night (moon)	day (sun)
small	big
cold	hot
humid	dry

Each of these elements exists in an interaction pattern with its opposite. In western thinking Yin-elements are often considered to be inferior or more negatively connotated in comparison to their Yang-counterparts. In eastern thinking Yin and Yang are seen as being dependent on each other. Considering one side of the polarity to be inferior would deteriorate the other side, too.

The Yin/Yang polarity can also be used for discussing system archetypes as introduced by Peter Senge [2006]. The system archetype "limits of growth" (see Fig. 1) is driven in the early phase by an escalation (Yang), in the long run the stabilizing loop (Yin) dominates. The overall development needs both: First a basis (Yin) then an active behavior (e.g. growth, motion etc. (Yang) then a dominance of stabilization of this

process (Yin) and finally a (dynamic) balance of Yin and Yang in order to keep the population stable. As we know from Aporia, no side can exist without the other, thus the system would collapse. A state where almost only Yang, and almost no Yin exists is devastating, e.g. like a star exploding like a supernova. A systems state where almost only Yin exists without almost any Yang is bound to collapse, e.g. like black-holes in Astronomy. A wonderful example for a balance of Yin and Yang is our sun: She has enough mass that yields to tremendous gravitation (Yin). This induces nuclear reaction on the sun – and lets her shine and warm our earth (Yang).

6. Yin/Yang versus Aporias

Although Yin/Yang polarities have some similarities with Aporias, there are also differences. First: Yin/Yang and Aporias emerged in completely different cultures. The Yin/Yang-Model is very fundamental and broadly known – even outside Daoism. The concept of aporetic conflicts is in western world rather new and by far not broadly known.

Second: For Aporias an understanding of the other side is an option, for Yin/Yang it is a must to incorporate the other side into one own side of the polarity. Therefore the wave-like Yin/Yang – symbol contains a little black spot in the center of the white area and a white spot in the black area. Third: We see in the concept of Aporia a deductive, static quality, opposed to the concept of Yin/Yang with an inductive, dynamic quality.

Thus the two concepts of Yin/Yang vs. Aporia are similar and yet somewhat different approaches to see and to deal with polarities. Applying the concept of Yin/Yang leads to a way of thinking beyond monocausal argumentation of the kind "the opposite of something true is wrong." Yin/Yang says from the very beginning: "The opposite of something true is also true." In a process of aporetic conflict solving, as it has been described by Gerhard Schwarz [2009], the typical initial position of both parties is: "I am right and since you are opposing me, you must be wrong". It might happen only after a tedious process of working on the conflict that people are ready to change their mind and to accept, that the other position is part of their own position. A typical example for this requirement to accept the other side for the own benefit are labor-conflicts between employers and employees. Both sides actually need the other side for their own wealth – destroying the other side would destroy the own existence.

7. Metanoia and the "limits of growth"

"Metanoia" has been introduced by Senge [2006] into Systems Thinking, meaning a radical change of mind. Ossimitz and Lapp [2006] have adopted this, even in the title of their book "The Metanoia-Principle". "With the term 'Metanoia-Principle' we mean that handling systems needs a fundamental new kind of thinking and acting."

Closing the circle we will give an example [Singh et al., 2001] of an "anti-growth" society. The example deals with a tribal population of the tropical island of Trinket with a population of less than 500 persons, belonging to the Nicobar archipelago in the eastern Indian Ocean. Nicobarese people have no currency[4], they are living mostly autonomous on their island and they have much leisure-time: All persons of an average household of nine members together invest less than four hours a day to meet their daily needs! The wealth of the Nicobarese are their pigs, which are owned by the women. The pigs get the nutritional surplus – and over the years the number of pigs increases. At some time the women complain about the load of work with the many pigs – and then the council of elders announces a pig festival, with about one pig per week being ritually slaughtered until the number of pigs has normalized again. One can see the act of slaughtering most of the pigs as an act of Metanoia, which is embedded in Nicobar culture.

Moreover we can see behind the slaughtering of the surplus pigs an systems principle, which is mostly neglected in western world: any kind surplus raises the issue (and often the burden) of how to get rid of it again or let us say it more moderately: how to use the surplus appropriately. A person collecting cars will be confronted more and more with the question: which car should I use today? A society accumulating more and more knowledge over the decades is confronted with the question of what to do with all the wisdom. Often the problem of how to make good use of the surplus is being concealed by saying that the surplus is a benefit in itself – and not a burden.

The example of how the Nicobarese get rid of their surplus shows fundamental differences in perception when compared to free-market economy. In our free-market economy we perceive a surplus never as a burden. Second: if a surplus in our society is being reduced (mostly by some external force), we perceive this as a tragedy. For the Nicobarese the slaughtering of their pigs is fun!

8. Conclusion

The western logic of true and false is insufficient for tracking resolving systemic situations, especially if time-delays and feedback structures are involved. We have discussed the concept of aporetic conflicts and the Yin/Yang concept of Daoism as two ways to go significantly beyond the limitations of western bivalent logic. Metanoia (the will to change one's mind radically

[4] The example reports the situation before the 2004/2005 tsunami, which induced a massive change in the Nicobar culture due to the financial character of the „help" supplied. The island of Trinket has been cut in two by the tsunami.

is essential for both of them. The term Metanoia reminds us that reaching a level beyond common logic is by far not trivial.

Acknowledgements

The research herein is partially conducted within Softnet Austria (www.soft-net.at) and funded by the Austrian Federal Ministry of Economics (bm:wa), the province of Styria, the Steirische Wirtschaftsförderungsgesellschaft mbH. (SFG), and the city of Vienna.

We also want to thank Shifu Oswald Elleberger and Christian Lapp for tough discussions, brilliant thinking and ingenious examples on the very topic.

9. References

[Dörner, 1989, 1997] Dietrich Dörner, *Die Logik des Misslingens – Strategisches Denken in komplexen Situationen*, Rowohlt, Reinbeck, 1989. English: *The Logic of Failure*. Basic Books 1997.

[Elleberger, 1995] Oswald Elleberger, *Qi Gong*, Kösel, München, 1995.

[Giacobbe, 2005] Giulio Cesare Giacobbe, *Wie Sie Ihre Hirnwichserei abstellen und statt dessen das Leben genieße*n, Goldmann, 2005.

[Lau, 1963] D. C. Lau, *Lao Tzu – Tao Te King,* Penguin Books Ltd., Harmondsworth, Middlesex, 1963.

[Ossimitz, 1998] Günther Ossimitz, *The Development of Systems Thinking Skills using System Dynamics Modelling Tools.* In: Cohors, Fresenborg, Elmar, Maier, Hermann, et al. (eds): Selected Papers from the annual Conference of Didactics of Mathematics 1996, pp 90-104. Osnabrück, 1998.

[Ossimitz, 2000] G. Ossimitz, *Entwicklung systemischen Denkens. Theoretische Konzepte und empirische Untersuchungen*, Profil Verlag, München, 2000.

[Ossimitz and Lapp, 2006] Günther Ossimitz and Christian Lapp, *Das Metanoia Prinzip – Eine Einführung in systemisches Denken und Handeln,* Franzbecker, Hildesheim, Berlin, 2006.

[Richmond 1991] Richmond, Barry: *Systems Thinking – Four Key Questions,* High Performance Systems, Lyme, N.H., 1991.

[Romer, 1990] Romer, Paul M, *Endogenous Technological Change*, Journal of Political Economy, University of Chicago Press, vol. 98(5), October 1990, pp. 71-102.

[Schwarz 2005] Gerhard Schwarz, *Die Heilige Ordnung der Männer. Hierarchie, Gruppendynamik und die neue Rolle der Frauen.* 4. erweiterte Auflage. VS Verlag für Sozial-wissenschaften, Opladen, 2005.

[Schwarz 2009] Gerhard Schwarz, *Konfliktmanagement – Konflikte erkennen, analysieren, lösen* 8th ed., Gabler, Wiesbaden, 2009.

[Senge 2006] Peter M. Senge, *The Fifth Discipline – The Art & Practice of the Learning Organization,* Doubleday, New York et al., 2006.

[Senge et al., 1994] Peter M. Senge, Art Kleiner, Charlotte Roberts, Rick Ross, Bryan Smith, *The Fifth Discipline Fieldbook: Strategies and Tools for Building a Learning Organization.* Broadway Business Group, New York, 1994.

[Singh et al., 2001] Simon J. Singh, , Clemens M. Grünbühel, H. Schandl, N. B. Schulz, *Social Metabolism and Labour in a Local Context: Changing Environmental Relations on Trinket Island.* Population and Environment, 23 (2001), 1, pp. 71-104.

[Staub, 2006] J. Staub, *Pflichtmediation: Mythos und Wirklichkeit*, ZVW 3, 2006.

[Watzlawick et al., 1967] Paul Watzlawick, Janet Beavin, Don. D. Jackson, *Pragmatics of Human Communication – A Study of Interactional Patterns, Pathologies, and Paradoxes*, W. W. Norton & Co., Inc., 1967.

[Watzlawick et al, 1974] Paul Watzlawick, John Weakland, Richard Fish, *Change. Principles of Problem Formation and Resolution.* W. w. Norton & Co 1974.