

**Systems thinkers: Check your scotomas and watch your language!**

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## **Systems thinkers: Check your scotomas and watch your language!**

Various belief constructs such as framing, dualisms, worldviews, paradigms and values are discussed to understand how these might result in scotomas. The observer is not independent and objective but has purpose and values within a group with a language. This leads to an exploration of conceptual metaphor within language as a way of accessing what is largely unconscious thinking and a potential source of scotomas. Examples of the use of conceptual metaphors in systems and complexity thinking are provided illustrating that conceptual metaphors can do work that is not easily performed by other methods in systems thinking currently. Without awareness of beliefs certain types of interactions or perspectives are neglected; patterns of behavior survive when they no longer serve; meaning is lost and marginalization continues unchecked.

Keywords: Systems thinking, complexity thinking, scotomas, observer, language, conceptual metaphors.

**Word count:** 7872

## **Introduction**

Systems thinking has long been recognized as being important in finding lasting solutions to problems that have eluded reductionist approaches (Meadows 2009, Mella 2012, Jackson 2003, R. L. Ackoff 1974). Senge describes systems thinking in a number of ways: “as a discipline for seeing wholes ... a framework for seeing interrelationships rather than things ... a process of discovery and diagnosis ... and as a sensibility for the subtle interconnectedness that gives living systems their unique character” (Senge 1991, 68-69).

Systems thinking is of interest in complex problems. The World Economic Forum report on *The Future of Jobs Report*, (2018) identifies “complex problem solving” as one of the most significant skills that will be required for 2022. Those who have been arguing that we are in a post-normal world where complexity, chaos and contradictions are the new norm, would wonder why only 2022 (Sardar 2015, Funtowicz and Ravetz 1993).

But some have concerns about “systems thinking” and its application in the context of complexity (Inayatullah 2002):

“Complexity [thinking], however, is not a return to systems thinking since the systems approach tends to be apolitical. It generally assumes that subsystems are interest-free or that analysis of the future can be done in a neutral fashion. While the systems approach has been of benefit [...] in the past few decades, its inattention to how systems approaches themselves embody a particular type of politics, and a particular language, leaves it handicapped.”

Inayatullah identifies a number of assumptions underlying systems thinking, which may

be scotomas<sup>i</sup>: *interest-free, neutral, politics and language*. The implication seems to be that a complexity approach will deal with the issues not addressed by systems thinking. Other researchers have argued that “...systems thinking [...] does not pay sufficient attention to what it is excluding and does not deal adequately with the paradoxes of organizational life” (Stacey, Griffin and Shaw 2000, 9). These issues include transformation and adaptation, in particular to unknown states or goals. This paper explores the issues raised by Inayatullah specifically. The scotomas discussed in this paper will be limited to those required to do this exploration.

On complex problems the observer<sup>ii</sup> cannot be interest-free, neutral or objective and is part of the intervention or inquiry (Montuori 2013). The observer has worldviews, paradigms and values which act as “filters” and the observer may be unaware of these. Systemic aspects which are outside the observer’s worldviews, paradigms or values are simply ignored – they are scotomas. Without surfacing these along with frames the same policy recommendations recur (Schon and Rein 1994). Disciplines and the process of specialization also act to create scotomas (Maruyama 2004). This has led, in part, to the emergence of second-order science which is trying to deal with current limitations of science in the realm of complex policy problems (Hodgson and Leicester 2017).

The issue of politics raised by Inayatullah, has received attention in systems thinking (Jackson 2003, Flood 2002). Flood uses the four windows metaphor of systems thinking (Flood 2002). The first two windows process and structure, are more familiar to some, but meaning (interpretive) and power and knowledge (critical) which are important for social interventions are not always known to those using process/structural approaches. Although established in the literature, it could be argued that some time is required to propagate these approaches. However, it seems there is more to adoption of these systems thinking methodologies than just propagation time. As an example, C.P.

Snow's - Rede Lecture presented in 1959 entitled "The Two Cultures and the Scientific Revolution" highlighted the divide between natural sciences and literary intellectuals. Snow writes that this "tone-deafness" (which is an auditory "scotoma") "doesn't come by nature, but by training, or rather the absence of training". The problem persists 60 years on. The conclusion is that this is not just a matter of propagation of knowledge but of a scotoma.

Systems thinking is required in more complex environments and so systems thinkers are being confronted by their scotomas. It is necessary to distinguish between the scotomas of the systems/complexity thinker as the facilitator (or the lead) of a group and the group of people itself. Systems thinking may surface scotomas within the group. But when the systems/complexity thinker is unaware of his or her scotomas, then the scotoma is projected and magnified onto the group.

This paper raises awareness of scotomas (arising from Inayatullah's observations) by sketching out the structures of belief to see where the blind spots might fall. A number of belief and related constructs are presented including framing, dualisms, worldviews, paradigms and values, each with a definition. The definitions are used as a way of contrasting differences between the belief concepts rather than an attempt to prescribe or control the definitions. The issue of the observer is revisited, debunking the myth of the objective independent observer. At this same time a connection to language is built, which does not appear to have been dealt with explicitly in the systems thinking literature. Language remains a challenge and forms a significant part of this paper. The paper considers scotoma arising specifically from metaphor based on conceptual metaphor theory. This will increase language awareness and offer a means of identifying additional scotomas while enhancing systems thinking understanding.

## **Common scotomas resulting from framing, dualisms, worldviews and paradigms**

"The range of what we think and do is limited by what we fail to notice. And because we fail to notice that we fail to notice, there is little we can do to change until we notice how failing to notice shapes our thoughts and deeds." - R. D. Laing.

This section introduces the more common scotomas resulting from framing, dualisms, worldviews and paradigms first because of their importance. Definitions of these concepts are provided so that the differences between the types of beliefs might become apparent.

**Framing** is to “select some aspects of a perceived reality and make them more salient [...], in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and or treatment recommendation” (Entman 1993). The word “select” indicates choice on the part of the person doing the framing and is more than a belief. The importance of addressing framing in complex strategic problems has been recognized but still remains neglected in many strategy development efforts (Schon and Rein 1994). The framing is sometimes shaped by the interests of powerful actors as opposed to being just socially learned or held tacitly. Some people may be aware of the particular framing, but it is held in place by those with authority or power. As an example, the Minister of Environmental Affairs setup a Committee of Inquiry *to investigate whether trade in rhino horn be legalized, or not*<sup>iii</sup>. This question was asked in preparation for the 17th Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). With this framing, there are two options: legalize trade of rhino horn or continue with the status quo where trading in rhino horn is illegal. However these are not the only options for addressing rhino poaching - there are many options. In the Committee of Inquiry’s final report,

there was a section on various options relating to trade versus alternative solutions<sup>iv</sup>.

**Dualism** is the division into two opposing poles, such as good vs. evil; order vs. chaos; rational vs. irrational; capitalism vs. communism and objective vs. subjective.

Reductionism vs. expansionism is a dualism that relates to the approach of traditional science on one hand and systems thinking on the other (R. L. Ackoff 1979). There is a cultural value attached to one pole over the other (Collins 2005). For example, good is preferred over evil and the objective is generally preferred over the subjective. Dualism creates a binary world that exacerbates complexity and is used as an example of how philosophy and culture can frame our thinking. A famous example of dualistic framing in politics so that the options appear mutually exclusive and the particular issue polarized: "You're either with us or against us in the fight against terror." (George W. Bush, 6 November, 2001). Dualism is a dominant frame that almost transparently pervades thinking, social discourse and even science (Collins 2005). Nicolescu (2010) dramatically criticizes this situation

"... the only knowledge worthy of its name must therefore be scientific, objective; the only reality worthy of this name must be, of course, objective reality, ruled by objective laws. All knowledge other than scientific knowledge is thus cast into the inferno of subjectivity, tolerated at most as a meaningless embellishment or rejected with contempt as a fantasy, an illusion, a regression, or a product of the imagination."

This can be seen as the disease of "scientism", the relentless pursuit of "objective" knowledge while devaluing the subjective. It is not uncommon for engineers and natural scientists dismiss social aspects as "fuzzy" or "soft". This is a particular problem when working with socio-cultural systems, such as organizations, that have a large subjective component (Gharajedaghi 2011). Collins (2005) argues that conflict is not inevitable but the result of simplistic communication arising from centuries of dualism. Dealing with

dualism involves first becoming aware of it in language. If people reflect, most will realize that there are some people that are mostly good, but may have some bad and some people are mostly bad, that have some good in them. There are increasing levels of realization: firstly that we have dualism, that there are social preferences for one of the poles, both poles occur simultaneously (“and”), and finally, the two poles do not just exist simultaneously but they are in tension with each other.

A **worldview** is a “belief structure, organizing principle, a way of thinking, and a mode of living” (Beck and Cowan 2002). Worldviews, what Checkland describes as *Weltanschauung*, are images in our heads which “normally go unquestioned” (Checkland 2001). Beliefs can form complex patterns such as images, mental models, or a system of beliefs.

When systems thinkers say they are applying systems thinking, they are invariably doing so from a particular **paradigm** (Kuhn 1970). This is important because “...our thinking is ruled by a profound and hidden paradigm without our being aware of it. We believe we see what is real; but we see in reality only what this paradigm allows us to see, and we obscure what it requires us not to see.” (Morin 2008). A paradigm is a belief system based on ontological, epistemological and methodological assumptions (Guba and Lincoln 1994). Systems thinking spans empirical, interpretive and critical methodological approaches and hence systemic perspectives outside the systems thinkers preferred paradigm are simply ignored. Systems thinking must be seen as transdisciplinary and requires operating meta-paradigmatically (Montuori 2013).

Frames, worldviews and paradigms are a problem for a number of reasons. Frames create controversies that cannot be solved by presenting more “facts” since the same facts are interpreted differently by different actors (Schon and Rein 1994). Without

surfacing worldviews, paradigms, and framing (including metaphors), the same policy recommendations recur. Finally, systems thinking methods transcend different “paradigms”. The following section considers values as a type of belief in systems and complexity thinking.

### **Values in systems and complexity thinking**

Although a number of constructs related to beliefs have been introduced which may lead to scotomas, there are others, such as ideologies and values. In this section, the focus will be on values for its ability to expose scotoma. If we accept Haralambos and Holborn (2004) then values are “a belief that something is good and desirable. It defines what is important, worthwhile and worth striving for.” Values lead to norms. Thus, if we value privacy as a collective value, then the norm is to knock on the door before entering someone’s office. What we value determines (to some extent) our focus and actions.

There has been a tendency to dismiss values as unstable and subjective. However recent studies show strong, statistically significant correlation between values such as self-expression and socio-political development and also self-expression and economic development (Inglehart and Welzel 2010). Methodological advances, combined with mass surveys have shown values to be stable and strong predictors of social, economic and political variables. Furthermore, Max-Neef’s asserts that values, as the most important aspect of a transdisciplinary approach, are most neglected and that without restoring our values, “we will not be able to successfully confront the great problematiques of the new century” (Max-Neef 2005). In the context of systems thinking, Gharajedaghi speaks of five social dimensions of the system under inquiry: wealth, power, knowledge, beauty and values (Gharajedaghi 2011, 95). The presence of

beauty is unusual (and will be discussed further) but so is the presence of values at the same level as power and wealth.

Victor Frankl, the psychiatrist who survived the Holocaust, reminds us that a “way of finding a meaning in life is by experiencing something—such as goodness, truth and beauty —by experiencing nature and culture or, last but not least, by experiencing another human being in his very uniqueness...” (Frankl 1985). Examples will be given for each of the transcendentals attributed to Plato: truth, beauty, and goodness. Under goodness, only ethics will be considered.

Starting with **truth**, the issue is not just what is truth, as an epistemological question, but how do the actors (including the observer) value truth, especially in a world of “fake news”. Science has established a “scientific caste system” (Aldous Huxley) in society which places scientists, as purveyors of truth, as the highest cast and other ways of knowing such as the arts, as the lowest cast. But even truth in science is under assault. Galileo Galilei laid the foundations for modern science with the three axioms for an experiment: reproducibility, quantification, and analysis (Pietschmann 1997).

Reproducibility is only relevant for repeatable properties, whereas complexity is, in terms of one definition, about novel emergent properties (Cilliers 2002). Not surprisingly, there is a reproducibility crisis in science, with 52% of respondents in one survey agreeing there is a crisis (Baker 2016). The factors contributing to irreproducible research are, amongst others: selective reporting, pressure to publish, and statistical issues. These factors include cases of fraud and insufficient peer review. But an analysis of these factors seems to indicate that even an experiment is conducted within a social and organizational context and hence science in a post-normal world is complex. Thus, under conditions of complexity, Galilei’s reproducibility axiom will be a challenge for an experiment in an organizational context.

In the context of the environment, the need for more focus on **ethics** and the spiritual is urgent: "I used to think that top environmental problems were biodiversity loss, ecosystem collapse and climate change. I thought that thirty years of good science could address these problems. I was wrong. The top environmental problems are selfishness, greed and apathy, and to deal with these we need a cultural and spiritual transformation." U.S. Advisor on Climate Change, James Gustave Speth<sup>v</sup>. This is one of many issues where ethics is critical but not central. Returning to systems thinking, a similar situation arises in relation to the system boundary.

In systems thinking a boundary is drawn between the "system" and its "outside". What is inside the system is based on framing, interest, influence, or what can be controlled. But systems boundaries are value laden, especially in social systems (Midgley 1992). For example in a business, who is allowed to participate in strategy development and who is not? The boundary around the business is what Midgely refers to as the primary boundary. But what about customers - are they really outside the boundary? What about those who are unemployed? The business logic of optimizing system performance and efficiency leads to socio-economic contradictions: lower production costs which can implies less work but to reduce the social burden of an idle population, more workers should be utilized (Lyotard 1984). The primary boundary hides, marginalizes and protects the status quo in a tacit or unconscious way (Midgley 1992). Moving from the primary boundary to a more inclusive secondary boundary (the expansionism referred to earlier) is an ethical and value laden decision (Midgley 1992). Critical approaches seek to surface assumptions about the status quo, emancipate the marginalized and expand cognitive autonomy (Jackson 2003, Krippendorff 1993).

If we consider **beauty** in systems thinking, one argument is that beauty is subjective and hence different for each person and therefore not worth considering as a "universal".

However to make such an argument is to ignore that each person will find something that is beautiful and that will fill them with awe. Many people experience such awe in the wilderness or in the presence of wildlife, especially large mammals such elephants.

According to CS Lewis,

“There seem, in fact, to be only two views we can hold about awe. Either it is a mere twist in the human mind, corresponding to nothing objective and serving no biological function, yet showing no tendency to disappear from that mind at its fullest development in poet, philosopher, or saint: or else it is a direct experience of the really supernatural, to which the name Revelation might properly be given.” (Lewis 2001, 6).

From Attention Restoration Theory, it is known that sleep is insufficient to restore attention when individuals have been working on a task (such as an assignment or project) for prolonged periods of time (Kaplan 1995). In such cases, being away in nature, where people experience fascination and awe is essential to restoring attention.

But even in more technical pursuits, aesthetics has been raised as absent (R. L. Ackoff 1979). Optimality measured only in terms of instrumental means and effectiveness and efficiency in achieving ends while ignoring aesthetics is “seriously deficient” (R. L. Ackoff 1979, 99).

The central issue is not only that people have a variety of values (pluralism), but rather that in many cases *we are not conscious of our values, but their impact is critical*. The development of value awareness in the observer requires constantly testing the assumptions that underlie our beliefs. In other words, what is the value of values?

### **The observer revisited**

Repeatability, discussed earlier, requires observers that are expected to be objective and

independent. This is what von Foerster calls “our cognitive blind spot and [...] peculiar delusion within our Western tradition” which he formulates as “The properties of the observer shall not enter the description of his observations” (Von Foerster 2007, 285). But without the observer there are no observations. Even in quantum mechanics observer independence has been challenged by recent experimental work (Proietti, et al. 2019). Based on the earlier discussion on dualism, the observer is *both* objective and subjective to some degree but not completely one or the other.

Churchman formulated several principals for critical systems thinking, the first of which he states with great insight: “The systems approach begins when first you see the world through the eyes of another” (Churchman 1968). This is a view from within that can only be “seen” by the observer through communication, “Anything said is said *by* an observer” and that “Anything said is said *to* an observer” (Von Foerster 2007). Thus, there is an observer that can describe something using language to a second observer. The two observers, with their language constitute a group. Although von Foerster indicates that the observers are part of society, this might be too broad. The observer, language and the group form an interconnected triad – none exists independently and none exist independent of society or the environment.

This paper places the observer in a group which is part of society. The group is assumed to be purposeful<sup>vi</sup>, and members of the group communicate to achieve the group’s purpose. A group evolves a particular “language” in speech or writing that has habits, ways of thinking, methods and external contexts that are shared. There may be values and interests which are widely accepted in the group and may differentiate groups. For example, two political parties have the same purpose, winning the elections, but different values and interests. The group considered here may not be culturally homogeneous and observers may speak different first languages – the group might well

be considered a system.

Based on Self-determination Theory, the observer is autonomous *when living out the observer's values* and heteronomous when governed by others (Chirkov, et al. 2003).

But the observer is *both* autonomous *and* heteronomous (Gonçalves 2018). However, an autonomous observer may *not* be an objective observer. The resolution to the “objective, independent” observer problem is for the observer to declare his/her purpose, values, and who is governing him/her.

Building on the notion of observer and group, language, and in particular conceptual metaphor, is explored in the next section.

### **The role of conceptual metaphor in systems thinking**

“Language shapes the way we think, and determines what we can think about.” -  
Benjamin Lee Whorf

The issue of language was raised as one of the challenges in systems thinking which is required for complexity. Language is not neutral - it is of critical importance to understand metaphors in the construction of framing and values in the context of complexity and systems thinking. The approach of this section will be to introduce metaphors, how metaphors form a system, and why this is important for systems thinking.

### ***Introduction to language and conceptual metaphor***

The language constitutes a universal, pervasive dimension of human existence (Cook-Greuter 2000). Once learned, language becomes an unconscious, automatic behaviour. Sensory input and inner experience are labelled concepts shared through language. Language is so deeply engrained that speakers of any given language are not aware of

the reality construction imposed on them by their language. If language remains unconscious, automatic and unexamined, it becomes a barrier to further development.

The concern with language here is in how it constitutes complexity and how it might be used to understand scotomas. Dealing with complexity requires greater use of the unconscious mind which has been shown to be more suited to the task than the conscious mind (Dijksterhuis and Nordgren 2006). Metaphors are mostly unconscious, automatic, and used with no noticeable effort, just like our linguistic system and the rest of our conceptual system. As Lakoff points out “what most people are not aware of, and are sometimes shocked to discover, is that most of our thought – an estimated 98 percent – is not conscious” (2008). Metaphors are fundamentally conceptual, not linguistic, in nature and can provide access to unconscious thought. Because “metaphors are so deeply embedded in our daily language that we become blind to the important ways in which they shape our thought and influence our behavior” they are scotomas (Kendall and Kendall 1993, 149). The unconscious can trap us if we are unaware but there is also the opportunity to use it more deliberately. From a systems thinking and complexity point of view, these “conceptual relationships which underlie metaphorical language appear to constitute a link between physical experience and the subjective self.” (Grady 1997). Metaphors are the main mechanism through which we comprehend abstract concepts and perform abstract reasoning. Metaphor allows us to understand a relatively abstract or inherently unstructured subject matter in terms of more concrete, or more structured subject matter.

The remainder of this section serves as an introduction to those who may not be familiar with conceptual metaphors and is based on the work of Lakoff and Johnson (1980). The metaphor examples serve to illustrate the notion of a metaphor and its various aspects. In the following sections, metaphors will serve to further extend our understanding of

systems thinking and scotomas.

The majority of language is metaphorical (Lakoff and Johnson 1980):

Our relationship has hit a dead-end street!

Look how far we've come.

It's been a long, bumpy road.

We can't turn back now.

We're at a crossroads.

We may have to go our separate ways.

The relationship isn't going anywhere.

We're spinning our wheels.

Our relationship is off the track.

The marriage is on the rocks.

We may have to bail out of this relationship.

There is conceptual system underlying English for understanding the abstract domain of love in terms of something more concrete, in this case a journey: LOVE (RELATIONSHIP) IS A JOURNEY<sup>vii</sup>. Conceptual metaphors, which are ways of thinking, manifest as linguistic expressions, which are ways of speaking (Kovecses 2010). Metaphor can be understood as a *mapping* (in a mathematical sense) *from a source domain* (in this case, journeys) to a *target domain* (in this case, love). Various sources are used to communicate different aspects of the target. From these examples, a number of conclusions can be made, which are referred to as *entailments*:

- The lovers are travellers on a journey together, with their common life goals seen as destinations to be reached.
- The relationship is their vehicle (be it a car, train, or airplane), and it allows them to pursue those common goals together. The relationship is seen as fulfilling its purpose as long as it allows them to make progress toward their common goals.

- The journey isn't easy. There are impediments, and there are places (crossroads) where a decision has to be made about which direction to go in and whether to keep traveling together.

Another example which is relevant to later discussion is AN ARGUMENT IS WAR:

Your claims are indefensible.  
He attacked every weak point in my argument.  
His criticisms were right on target.  
I demolished his argument.  
I've never won an argument with him.  
You disagree? Okay, shoot!  
If you use that strategy, he'll wipe you out.  
He shot down all of my arguments.

A further example, also discussed again later, is the Conduit metaphor (Reddy 1979):

The meaning is right *there in the words*.  
It is difficult to put this concept into words.  
His email brought the idea to the Council.

Some qualifiers are in order. Firstly, not all language is metaphorical. Some aspects relating to concrete physical experience are literal, for example: *The cat is on the mat*. Secondly, not everything is mapped from source to target. There are aspects of the target that are *highlighted* and certain aspects are *hidden*. In LOVE (RELATIONSHIP) IS A JOURNEY metaphors, some highlighted progress on the journey, while hiding decisions that need to be taken at the crossroads. Thirdly, mappings may be partial. Consider for example the Conduit metaphor: I can *give* you an idea, but I still *have* it. This is not true in the source domain of physical objects. If you give away your money, you no longer have it. Conceptual metaphors are more complex than this basic introduction might lead the reader to believe and the interested reader is urged to seek

out the references for deeper understanding.

### ***Metaphor as system***

Having introduced the conceptual metaphor, this section postulates metaphor as system<sup>viii</sup> that involves two main aspects: i) the group, as introduced in *The observer revisited* and ii) a set of metaphors used in cognition and communication within the group.

It is important to state that metaphor as system occurs within a group, lest the casual reader of conceptual metaphor literature in cognitive linguistics be tempted to think that the people have been reduced to decontextualized “utterances”. Groups are formed, new observers enter the group, participate and leave and finally the group itself is disbanded. The stages of small group development and communities of practice literature may be of use in understanding this (Tuckman and Jensen 1977, Wenger 1999). These issues are of particular importance when the observer is not native to the group.

The set of metaphors that occur commonly in a group, reflect shared ways of thinking about something. The important elements of conceptual metaphor theory are summarized (Krippendorff 1993):

- A metaphor is a mapping of a more familiar or concrete source domain to target domain;
- There is a structure that is inherited from the source domain in the mapping, which leads to highlighting and hiding of various aspects of the target domain (illustrated in the previous section). Furthermore, aspects of metaphor are emphasized or de-emphasized and over time their interpretation normalized (Grady 1997);

- Entailments provide conclusions in the target domain that can be drawn from the use of a particular conceptual metaphor (Krippendorff 1993); and
- These metaphors can organize the observer's perceptions. When the observer acts on these perceptions, they can create the "reality" that the observer experiences.

Further examples are provided in the next section.

### *Examples of the uses of conceptual metaphor in systems and complexity thinking*

There are many uses for metaphor in movies, myths, art, architecture, advertising and in dream and symbol interpretation (Kovecses 2010). This section brings together the material presented thus far in examples of uses of metaphor in systems or complexity thinking. Seven major uses relevant to systems and complexity thinking are identified:

- (1) *Different metaphors frame issues differently leading to different policy outcomes.* In one study the same numerical facts were presented with two different metaphors for crime (Thibodeau and Boroditsky 2011). The first metaphor framed crime as a beast compared with the second metaphor which framed crime as a virus, leading to two different policy recommendations: incarcerate vs educate respectively. Framing is at least in part the selection of a metaphor, usually at an unconscious level. War metaphors ("the fight against tuberculosis"), the NATION AS BODY and ECONOMY AS BODY litter the policy space (Vallis and Inayatullah 2016). For example "economic growth" is based on what is healthy for a human body (as source domain), while a lack of growth is seen as unhealthy. However, as was indicated, metaphors are partial

mappings. Humans stop growing. In systems thinking, there are limits to growth (Meadows 2009). However GDP is implicitly expected to grow indefinitely.

- (2) Another study found that part of the *reason for this framing effect is that some metaphors are more systemic in nature* (virus) than others (beast) and hence these metaphors promote more systemic thinking and can lead to “a transferable systems thinking mindset” (Thibodeau, Winneg, et al. 2015).
- (3) Metaphors can facilitate understanding in systems thinking that is not readily achieved in other ways. The example is understanding conservative vs liberal politics in the U.S. Lakoff found an unconscious metaphor, the NATION AS FAMILY, links conservative-liberal politics to two systems of morality: the Strict Father Model and the Nurturing Parent Model (Lakoff 2008). Each of these is based on various conceptual metaphors that organize a system of moral values. The Strict Father Model is based on MORALITY IS STRENGTH, taking the notion of physical strength:

BEING GOOD IS BEING UPRIGHT  
BEING BAD IS BEING LOW  
DOING EVIL IS FALLING  
EVIL IS A FORCE.

This entails that the world is divided good and evil and that one must “stand up to” evil to be morally strong (Lakoff 2008). It enforces other dualisms such as man over woman, and man over environment. The Nurturing Parent Model derives from MORALITY IS NURTURANCE (Kovecses 2010):

THE COMMUNITY IS A FAMILY  
MORAL AGENTS ARE NURTURING PARENTS  
PEOPLE NEEDING HELP ARE CHILDREN NEEDING NURTURANCE  
MORAL ACTION IS NURTURANCE.

In practice people may adopt a blend of the two models giving preference to a model.

- (4) Communication can be understood through a variety of conceptual metaphors, summarized in Table 1 (Krippendorff 1993). This is of particular interest when analyzing group communication. It also provides a “vocabulary” for talking about the different types of language discussed in section 3. The control metaphor has been the metaphor of the mass media; similarly war is the metaphor of communication in the courtroom. The dance-ritual metaphor is of importance to learning organizations (Argyris, Putman and McLain-Smith 1985) and Bohm’s concept of dialogue (Bohm 2013).

Table 1 Communication metaphors (Krippendorff 1993)

Metaphor	Entailments
Conduit (Reddy 1979))	<ul style="list-style-type: none"> <li>i) Ideas, thoughts, meanings or feelings are Objects.</li> <li>ii) In speaking or writing, these Objects are placed into “signals” or words in language.</li> <li>iii) Communication is transferring Objects in “signals” or words in language.</li> <li>iv) The sender is far more responsible for the communication than the receiver.</li> </ul>
Container	<ul style="list-style-type: none"> <li>i) Emphasis on the content of messages but leaving the language and communication process transparent, un-reflected and unattended.</li> <li>ii) Communication contents as objective entities that exist independent of human experience.</li> <li>iii) Communication as transportation.</li> </ul>

	iv) “Good” communication is sharing.
Transmission	<p>i) Information is encoded for transmission over the channel.</p> <p>ii) The receiver reproduces the information by decoding the message which is the inverse of the encoding operation. This requires understanding of the encoding.</p> <p>iii) Requires a more sophisticated model which places a cognitive burden on the communicator beyond just seeing the symbols.</p>
Control	<p>i) Communication is a causal phenomenon.</p> <p>ii) Means for achieving particular objectives, and in the extreme, an instrument of manipulation.</p> <p>iii) Active, informed senders and passive and uninformed receivers and consumers.</p> <p>iv) Communication is deemed successful if it achieves its objective in ii).</p>
War	<p>i) Sets communicators against each other (dualistic).</p> <p>ii) If there is nothing to “win”, it may prevent effective problem solving.</p>
Dance-ritual	<p>i) There is a ritual component to communication beyond content and purpose which unifies the group.</p> <p>ii) Maintain the flow of conversation, with the participants as replaceable performers, taking turns. Mutual engagement.</p> <p>ii) Cooperative and communal activity where everyone has a turn. Participants are equal: the marginalized can be heard in a power neutral space. Circular movement of meaning between one speaker and the next. A jointly woven fabric is created through participant construction.</p>

	iii) Leaves something recognizable behind – a change in ideas or a historical record.
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- (5) Metaphors can be used to “read” and understand an organizational situation, design a preferred situation and transform to the preferred situation. Morgan has identified organizational metaphors in this regard: machine; organism; brain; culture; political; psychic prison; flux and transformation and the domination metaphors (Morgan 1986). Each metaphor offers a dimension for consideration, for example, organization as machine, entails people as replaceable “parts”.
- (6) Improve the acceptance of information system development methodologies by matching it to the development team metaphors, listed in Table 2 (Kendall and Kendall 1993). There have undoubtedly been many methodological advances in the intervening period since this research was published, but this serves as an illustration.

Table 2: Common organizational metaphors and their key attributes (Kendall and Kendall 1993).

Metaphor	Orientation	Environment	Type of Leader Needed	Methodology
Game	Goal	Order	Coach	Traditional Systems Development Life-cycle
Machine	Goal	Order	Designer	Structured tools
Journey	Goal	Chaos	Captain	Prototyping
Jungle	Alternative	Chaos	Guide	Project champion as guide

Family	Alternative	Order	Head	Participative approaches emphasizing stakeholder involvement
Zoo	Alternative	Chaos	Keeper	Soft Systems Methodology
Society	Alternative	Order	Head of State	Social process drawing on various social theories
War	Goal	Chaos	General	None identified
Organism	Balanced	Both	Innovator and Nurturer	None identified

(7) Metaphors are especially important in future studies. Metaphor can be used to critique the present at a deeper, unconscious level and through alternative metaphors, open up alternative futures (Inayatullah 2007). One example in medicine that delayed progress was the “The brain as machine” metaphor, which suggests that there are functions prewired into specific parts of the brain, and that if that part of the brain performing a certain function is damaged, that function can no longer be performed. The disability was “hardwired” and there was no way to “fix it” (Doidge and Rountree 2016). However, patients would occasionally get better, and it was later discovered that brain has the ability to learn new “paths” around damaged areas called neuroplasticity.

Using conceptual metaphors, underlying or latent thinking can be surfaced, challenged and new ways created through new metaphors. It is also in the things that are mapped or

not mapped (source-target) that scotomas occur.

## **Conclusions**

Just as the driver of a car must check their blind spots, so too must serious systems or complexity thinkers check their scotomas. Systems thinkers must watch their language and the language of those involved in an intervention. A lack of awareness of the observer's scotomas does not just lead to one or two missing interactions but entire perspectives. Part of the problem of systems thinking is that the number of perspectives that must be considered is large and covers multiple paradigms. Scotomas will occur when outside the observer's primary paradigm. One approach to improving the situation is to trace one's development of paradigm. However, merely being aware of scotomas will not give us mastery over them. Their roots run deep and long and are not easily extracted. There is a temptation to make judgements and claims about other's blind spots but inadvertently missing one's own and hence the list of scotomas in this paper cannot be complete.

A number of examples have illustrated that language is the Trojan horse that carries hidden politics, value judgements, power and control in and out of the individual, and in particular the unconscious. A more active consideration of language allows systems thinking to move from an abstract logic to legitimize narrative (Lyotard 1984). The concept of "system" can itself cast a shadow and must be balanced: "Narrative reveals what systems theory occludes; systems theory articulates what narrative struggles to see." (Hayles 1995, 72). Advancing the use of conceptual metaphor in systems and complexity thinking provides access to the links between thinking (the subjective), a group within society (inter-subjective) and objective spaces that are important for transdisciplinary approaches (Nicolescu 2010).

This paper has argued that i) without awareness of framing, dualism, worldviews, paradigms, and values, certain types of interactions or perspectives are neglected; patterns of behavior survive when they no longer serve; meaning is lost and marginalization continues unchecked; ii) this awareness is assisted by inclusion of conceptual metaphor analysis as part of the systems and complexity thinking toolbox; iii) that conceptual metaphors within a group can do work that is not easily performed by other methods in systems thinking currently; and iv) conceptual metaphors are the dipstick of the unconscious mind.

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### **References**

- Ackoff, Russel L. *Redesigning the Future: A Systems Approach to Societal Problems*. J. Wiley and Sons, 1974.
- Ackoff, Russell L. "The future of operational research is past." *Journal of the operational research society* (Taylor & Francis) 30 (1979): 93-104.
- Argyris, Chris, Robert Putman, and Diana McLain-Smith. *Action Science: Concepts, Methods and Skills for Research and Innovation*. New York: Jossey Bass, 1985.
- Baker, Monya. "Is there a reproducibility crisis? A Nature survey lifts the lid on how researchers view the 'crisis' rocking science and what they think will help." *Nature* (Nature Publishing Group) 533 (2016): 452-455.
- Beck, D., and C. Cowan. *Spiral Dynamics: Mastering Values, Leadership, and Change: Exploring the New Science of Memetics*. 5. Blackwell Publishing, 2002.
- Bohm, David. *On dialogue*. Routledge, 2013.
- Checkland, Peter. "Rational analysis for a problematic world revisited." Chap. *Soft Systems Methodology*, edited by Jonathan Rosenhead and John Mingers, 61-89. John Wiley and Sons, 2001.
- Chirkov, Valery, Richard M. Ryan, Youngmee Kim, and Ulas Kaplan. "Differentiating autonomy from individualism and independence: a self-determination theory perspective on internalization of cultural orientations and well-being." *Journal of personality and social psychology* (American Psychological Association) 84 (2003): 97.
- Churchman, Charles West. *The systems approach*. Delta, 1968.
- Cilliers, Paul. *Complexity and postmodernism: Understanding complex systems*. Routledge, 2002.
- Collins, M.D. "Transcending Dualistic Thinking in Conflict Resolution." *Negotiation Journal* 21 (2005): 263-280.
- Cook-Greuter, Susanne R. "Mature ego development: A gateway to ego transcendence?" *Journal of Adult Development* (Springer) 7 (2000): 227-240.
- Dijksterhuis, Ap, and Loran F. Nordgren. "A theory of unconscious thought." *Perspectives on Psychological science* (SAGE Publications Sage CA: Los Angeles, CA) 1 (2006): 95-109.

- Doidge, and Robert Rountree. "Neuroplasticity and Healing: A Clinical Conversation with Norman Doidge, MD, and Robert Rountree, MD." *Alternative and Complementary Therapies* 22 (2016): 181-188.
- Entman, Robert M. "Framing: Toward clarification of a fractured paradigm." *Journal of communication* (Wiley Online Library) 43 (1993): 51-58.
- Flood, Robert Louis. *Rethinking the fifth discipline: Learning within the unknowable*. Routledge, 2002.
- Fraher, Amy L. "Systems psychodynamics: the formative years of an interdisciplinary field at the Tavistock Institute." *History of Psychology* (Educational Publishing Foundation) 7 (2004): 65.
- Frankl, Viktor E. *Man's search for meaning*. Simon and Schuster, 1985.
- Funtowicz, Silvio O., and Jerome R. Ravetz. "Science for the post-normal age." *Futures* 25 (1993): 739-755.
- Gharajedaghi, J. *Systems thinking: Managing chaos and complexity: A platform for designing business architecture*. Third. Elsevier, 2011.
- Gonçalves, Duarte. "Understanding Actors in Complex Security Problems." *International Journal of Strategic Decision Sciences (IJSDS)* (IGI Global) 9 (2018): 1-18.
- Grady, Joseph. "Foundations of meaning: Primary metaphors and primary scenes." Ph.D. dissertation, University Of California, Berkeley, 1997.
- Guba, Egon G., and Yvonna S. Lincoln. "Competing paradigms in qualitative research." *Handbook of qualitative research* (Sage, Thousand Oaks, CA) 2 (1994): 105.
- Haralambos, M., and M. Holborn. *Sociology: themes and perspectives*. Sixth. Collins Educational, 2004.
- Hayles, N. Katherine. "Making the Cut: The Interplay of Narrative and System, or What Systems Theory Can't See." *Cultural Critique* (University of Minnesota Press), 1995: 71-100.
- Hodgson, Anthony, and Graham Leicester. "Second-Order Science and Policy." *World Futures* (Taylor & Francis) 73 (2017): 119-179.
- Inayatullah, Sohail. *Questioning the future: methods and tools for organizational and societal transformation*. Third. Tamkang University Press, 2007.
- Inayatullah, Sohail. "Reductionism or layered complexity? The futures of futures studies." *Futures* 34, no. 3-4 (2002): 295-302.
- Inglehart, Ronald, and Christian Welzel. "Changing mass priorities: The link between modernization and democracy." *Perspectives on Politics* (Cambridge Univ Press) 8, no. 02 (2010): 551-567.
- Jackson, Michael C. *Systems thinking: Creative holism for managers*. Chichester: Wiley, 2003.
- Kaplan, Stephen. "The restorative benefits of nature: Toward an integrative framework." *Journal of environmental psychology* (Elsevier) 15 (1995): 169-182.
- Kendall, Julie E., and Kenneth E. Kendall. "Metaphors and Methodologies: Living beyond the Systems Machine." *MIS Quarterly* (Management Information Systems Research Center, University of Minnesota) 17 (1993): 149-171.
- Kovecses, Zoltan. *Metaphor: A practical introduction*. Oxford University Press, 2010.
- Krippendorff, Klaus. "Major metaphors of communication and some constructivist reflections on their use." *Cybernetics & human knowing* 2 (1993): 3.
- Kuhn, Thomas S. *The Structure of Scientific Revolutions, 2nd enl. ed.* University of Chicago Press, 1970.
- Lakoff, George. "The political mind." *New York: Viking* 176 (2008): 93-98.
- Lakoff, George, and Mark Johnson. *Metaphors we live by*. Chicago, 1980.
- Lewis, Clive Staples. *The problem of pain*. Zondervan, 2001.
- Lyotard, Jean-François. *The postmodern condition: A report on knowledge*. Vol. 10. U of Minnesota Press, 1984.
- Maruyama, Magoroh. "Peripheral Vision: Polyocular Vision or Subunderstanding?" *Organization Studies* (Sage Publications) 25 (2004): 467-480.
- Max-Neef, Manfred A. "Foundations of transdisciplinarity." *Ecological economics* (Elsevier) 53, no. 1 (2005): 5-16.
- Meadows, Donella H. *Thinking in Systems A Primer*. UK: Earthscan, 2009.
- Mella, Piero. *Systems thinking: intelligence in action*. Vol. 2. Springer, 2012.
- Midgley, Gerald. "The sacred and profane in critical systems thinking." *Systems practice* 5 (2 1992): 5-16.
- Montuori, Alfonso. "Complexity and transdisciplinarity: Reflections on theory and practice." *World Futures* (Taylor & Francis) 69 (2013): 200-230.

- Montuori, Alfonso. "The complexity of transdisciplinary literature reviews." *Complicity: An International Journal of Complexity and Education* 10 (2013): 45-55.
- Morgan, Gareth. *Images of organization*. Wiley Online Library, 1986.
- Morin, Edgar. *On complexity*. Hampton Press (NJ), 2008.
- Nicolescu, B. "Methodology of Transdisciplinarity – Levels of Reality, Logic of the Included Middle and Compleity." *Transdisciplinary Journal of Engineering & Science* 1, no. 1 (2010): 19-38.
- Pietschmann, H. "Three Limits of Scientific Knowledge." Edited by Giacomo Costa, Giorgio Calucci and Marcello Giorgi. *Conceptual Tools for Understanding Nature: Proceedings of the Third International Symposium*. World Scientific Publishing Co. Pte. Ltd. Singapore, 1997. 11-20.
- Proietti, Massimiliano, et al. "Experimental rejection of observer-independence in the quantum world." *arXiv preprint arXiv:1902.05080*, 2019.
- Reddy, Michael. "The conduit metaphor." *Metaphor and thought* (Cambridge University Press Cambridge) 2 (1979): 285-324.
- Sardar, Ziauddin. "Postnormal times revisited." *Futures* (Elsevier) 67 (2015): 26-39.
- Schon, Donald A., and Martin Rein. *Frame reflection: Toward the resolution of intractable policy controversies*. Basic Books, 1994.
- Senge, Peter M. "The fifth discipline, the art and practice of the learning organization." *Performance+ Instruction* (Wiley Online Library) 30 (1991): 37-37.
- Stacey, Ralph D., Griffin, and Patricia Shaw. *Complexity and management*. Routledge, 2000.
- Thibodeau, Paul H., and Lera Boroditsky. "Metaphors We Think With: The Role of Metaphor in Reasoning." *PLOS ONE* (Public Library of Science) 6 (02 2011): 1-11.
- Thibodeau, Paul H., Anna Winneg, Cindy Frantz, and Stephen J. Flusberg. "Systemic Metaphors Promote Systems Thinking." *CogSci*. 2015.
- Tuckman, B. W., and M. C. Jensen. "Stages of small-group development revisited." *Group and Organizational Studies* 2 (1977): 419-427.
- Vallis, Rhyll, and Sohail Inayatullah. "Policy metaphors: From the tuberculosis crusade to the obesity apocalypse." *Futures* (Elsevier) 84 (2016): 133-144.
- Von Foerster, Heinz. *Understanding understanding: Essays on cybernetics and cognition*. Springer Science & Business Media, 2007.
- Wenger, Etienne. *Communities of practice: Learning, meaning, and identity*. Cambridge university press, 1999.
- World Economic Forum. "The Future of Jobs Report." 2018.

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- <sup>i</sup> A scotoma is a blind spot in what is normal vision. A person with a scotoma is not aware of the scotoma. Since readers might not be familiar with the meaning of scotoma, this obscure word becomes the symbol of a blind spot.
- <sup>ii</sup> This paper will refer to an observer in keeping with the literature. Observer will include the systems thinker, inquirer or researcher, which suggests some distance from the issue. The observer as interventionist implies observer action from within the system. Based on the audience considerations, this paper is written in third person which normally signals an objective style of writing.
- <sup>iii</sup> [https://www.environment.gov.za/mediarelease/molewa\\_onlegaltradeofrhinohornornot](https://www.environment.gov.za/mediarelease/molewa_onlegaltradeofrhinohornornot)
- <sup>iv</sup> Summary report of the Committee of Inquiry appointed by the Minister of Environmental Affairs to advise on the possibility of proposing legal international trade in rhino horn to the 17<sup>th</sup> Conference of the Parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), or not. Accessed [https://www.environment.gov.za/sites/default/files/reports/summaryreport\\_committeeofinquiry.pdf](https://www.environment.gov.za/sites/default/files/reports/summaryreport_committeeofinquiry.pdf)
- <sup>v</sup> [http://www.huffingtonpost.co.uk/daniel-crockett/nature-connection-will-be-the-next-big-human-trend\\_b\\_5698267.html/Nature](http://www.huffingtonpost.co.uk/daniel-crockett/nature-connection-will-be-the-next-big-human-trend_b_5698267.html/Nature)
- <sup>vi</sup> This choice is based on a teleological worldview and is not made without awareness of its limitations, for example, *being* could be construed as purposeless. Also there are psychological issues that arise when a group does not have purpose – for an introduction refer to Fraher (2004). There are also multiple views of teleology, which are outside the scope of this paper (Stacey, Griffin and Shaw 2000).
- <sup>vii</sup> This paper uses the shorthand notation used in the conceptual metaphor literature:  
CONCEPTUAL DOMAIN A IS CONCEPTUAL DOMAIN B.
- <sup>viii</sup> Metaphor as system is **not** a reference to the two large metaphor systems: The Great Chain of Being metaphor and the Event Structure metaphor, that have been identified in the literature (Kovecses 2010).