USING CAUSAL LOOP DIAGRAMS TO DEAL WITH COMPLEX ISSUES: MASTERING AN INSTRUMENT FOR SYSTEMIC AND INTERACTIVE CHANGE

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The most persistent stereotype of management consultants is probably that they are experts who have all the answers. Their added value appears to be that they know what clients don't know – and they can suggest "best practices" so clients don't have to reinvent the wheel. Such a role makes historical sense, given that the consultancy sector was largely created by engineers, accountants and psychologists, all using the expert model. But there are more reasons for its persistence. For clients, idealizing consultants' expertise or approaches reduces their anxieties in taking on challenges. For consultants, hyping their services has a commercial pay off and may boost their ego. They do this by way of glossy presentations, reference lists and benchmarks, but also more subtly by name-dropping and verbal agility. Decades of advocacy for other consultancy roles and contingency thinking, however, underlines that there are downsides to the expert model (e.g., Schein, 1999). The more ambiguous problems are, the less consultants are able to provide the answers beforehand. There are no "magical solutions," even though the pressure to provide them is strongest when dealing with ambiguity.

Causal loop diagrams (CLDs) are a powerful consultant's tool for dealing with complex problems. Such problems are characterized by both content complexity and process complexity (Rittel & Webber, 1973; Vermaak, 2009). *Content complexity* refers to problems being multidimensional and ambiguous, with many interrelated aspects and feedback mechanisms. People experience the latter when they try to change things and the "system pushes back." This type of complexity requires working *systemically* by unraveling the underlying dynamics behind a multitude of symptoms. *Process complexity* refers to many people being involved in the problem with different viewpoints and interests. Participation is often ill structured and system limits seem arbitrary. Also issues cannot be well understood by thinking about it beforehand, but only by addressing them along the way. This dynamic precludes linear change approaches. Process complexity requires working *interactively* because contributions from different sides are needed to understand and address the issues. When consultants deviate from the default expert identity to deal with complex issues, they need tools that support such a shift. Where most standardized models and practices fall short, causal loop diagrams are particularly well suited to working both systemically and interactively.

Causal loop diagramming is the most striking component of system dynamics. It was popularized in the management arena by Peter Senge in the 1990s and has been recognized as a powerful tool for complex issues. However, this recognition never translated itself into wide application (Warren, 2004; Zock & Rautenberg, 2004). One explanation is that the tool tries to bridge contrasting worlds – applying an analytical method to deal with social problems. It uses a systemic approach to get a grasp on issues that will remain partly unknowable and unmanageable (Flood, 1999). This gives CLDs their added value, but also leads to discomfort: for engineers they feel too fuzzy; for "people persons" they feel too technical. Not only does this lead to CLDs being underused, it also leads to typical pitfalls. One pitfall is not addressing context complexity, which happens when consultants use it as a discussion aid but discard analytical rigor – diagrams are drawn as a fuzzy visualization tool for intuitive insights. The opposite pitfall is not addressing process complexity, which happens when experts lock themselves away in apparent service of research rigor. However, a perfect diagram rarely suffices to bring about change. It disappears into a desk drawer if people don't buy into it or if it does not resonate with their own understanding.

The chapter discusses ways to counter these popular pitfalls by presenting lessons learned based on working with such diagrams over the last twenty-five years, both creating them in consultancy projects and enabling other change agents to do so. In the first part of the chapter, technical "rules of thumb" are discussed to capture systemic dynamics in a CLD. A five-step approach is outlined, explained and illustrated – a method that is sufficient to enable even non-experienced diagrammers to get going. However, diagramming becomes a truly powerful tool when people are involved in using or making them. In the second part of the chapter, three contrasting approaches are outlined to do this, different both in purpose and intensity of participation. Each of these interactive intervention designs is illustrated with a case example. Both parts can assist change agents to design a change approach geared to any individual case in a way that takes full advantage of the instrument's potential to deal effectively with tough issues. My stance in this chapter is that powerful diagramming requires sufficient understanding of both its technical and its intervention aspects and that neither is straightforward. However, sufficient proficiency allows CLDs to be a critical component in any consultant's toolkit focused on complex organizational change.

WORKING SYSTEMICALLY:
THE TECHNIQUE OF CAUSAL LOOP DIAGRAMS

Systems thinking is a container concept for a broad spectrum of schools, concepts and instruments that have emerged since the 1940s. What they have in common is that they (1) don't only examine the parts but also the whole to understand how systems behave, and (2) examine interdependencies between factors, forces and suchlike. Early schools in this realm are cybernetics, system dynamics, and open systems theory. More recent additions include soft systems methodology and chaos theory. Causal loop diagrams stem from the system dynamics school. Hard core system dynamicists often use them in combination with stock-and-flow diagrams and behavior-over-time graphs. For the purpose of this chapter, however, these uses are set aside: CLDs on their own are already very useful.

Discerning feedback mechanisms (both positive and negative) is a typical characteristic of CLDs and finding these helps explain why some issues tend to persist despite many efforts to address them. These mechanisms can be invisible at first glance, because causes may be far removed from their consequences and those causes can be subtle or have a delayed impact. Causal loop diagrams can bring them to light and help understand underlying dynamics, which remain hidden when interrelationships between the many factors involved are left uncharted. Another value of the diagrams is that they can be used to identify points of leverage for addressing the issues at hand. Isolated attempts to bring about permanent change are doomed without such points of leverage as the stabilizing resistance of dominant routines easily neutralizes most efforts. Integral change approaches do not fare much better as they tend to target too wide an array of aspects, spreading the change efforts too thin. Within this context, the associated interventions compete for time and money, and often will even contradict each other. Finding points of leverage and matching them to a focused set of interventions constitute the core of devising an effective change strategy (Caluwe & Vermaak, 2003).

To provide an impression of a CLD, Figure 12-1 provides a simple textbook example, the systems archetype "shifting the burden." The diagram sheds light on why seemingly straightforward fixes can backfire and make matters worse (Senge, 1990). It also illustrates how a tiny CLD can tell a complex story more concisely than a text. This represents a key challenge – CLDs benefit from intelligent simplification – which leads to a balancing act in creating effective diagrams. They need to be *rich* enough to capture underlying mechanisms, *precise* enough to spot leverage, but also *simple* enough so that most important dynamics clearly stand out.
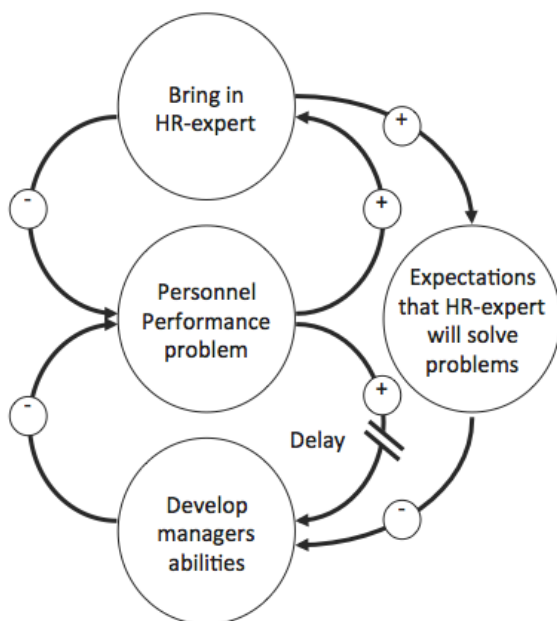
The diagram concerns an organization facing mediocre staff performance, aggravated by busy line managers neither spending the time nor having the ability to coach staff employees. It seems like the problem can be dealt with in the short term by bringing in a human resource expert, although one extra pair of hands cannot accomplish what a whole group of managers might. The diagram shows that bringing in a HR expert is a symbolic solution that can actually prevent managers from doing what they should have done in the first place, namely spending more time and effort taking care of their staff. Because of this, the symbolic solution can make matters worse in the long run. Managers' development erodes as they keep turning to HR expert who 'fixed it last time'. Overhead cost rise while managers' effectiveness falls and the personnel performance problem persists.

Figure 12-1 A systems archetype

Such "ready-made" archetypes are useful for reflection purposes; they present a quick and easy way to spot feedback loops. It is the most popularized use of causal loop diagrams. However, much more powerful is to make and use diagrams customized for specific situations. No standardized archetype can do complex situations justice and both insight and action perspectives will be limited as a result. Moreover, customized work rightly emphasizes the fact that causal loop diagrams are neither generalized truths nor pre-deterministic – they change over time and between places. However, tips on how to customize them are not that accessible and the associated literature is often overly technical. Table 12-1 summarizes the most relevant rules of thumb derived for creating such diagrams.

PRE	Delineate the issue and diagnose from multiple viewpoints
1	Use your gut feeling to pick the top 10 factors out of the full range of data.
2	Sense a storyline, draw loops and fill in the gaps
3	Check arrows for cause and effect: 'more of this = 'more/less of that'
4	Walk through the diagram; redraw it as a recognizable set of circles
5	Deduce and discuss points of leverage & monitoring.
POST	Testing and using your diagram to affect change

Table 12-1 Five Steps to Creating an Effective Causal Loop Diagram

Pre-phase: Delineate the Issue and Diagnose from Multiple Viewpoints
You can make a CLD about anything, but not about everything. I have seen people make a diagram of their entire company when the issue was much more focused, e.g., sick leave. This causes them to be overwhelmed by much irrelevant data, which obscures underlying patterns during the diagramming process. An opposite pitfall occurs when change agents choose convenient limits (like their own department) even though the problem transcends such boundaries. Senge (1990, p. 67) refers to this as "dividing an elephant in half" and concludes that "you don't have two small elephants then; you have a mess." A system can only be understood by studying it as a whole. The issue at hand – in combination with the ambition level of the change agents involved – defines a reasonable system limit.
Another prerequisite is to have reliable diagnostic data with which to work. This implies having observed and interpreted the case from multiple perspectives so as not to miss important pieces of the puzzle. One frequent pitfall to be circumvented here is an unwanted dominance of "hard" data over "soft" data, as the former (e.g., structure, strategies, procedures, products) is often represented in documents and easily spotted, but the latter (e.g., stories, conflicts, values, history, people) often hold the key to spotting underlying patterns. Thus it is important to take such soft information at least as seriously.

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Step 1: Use your Gut Feeling to Select a Set of Key Factors

A course participant once came up with a CLD for his own case in record speed. It was a neat and simple one – seven factors making up one big loop. Upon discussion he said that the CLD nicely represented his original ideas but failed to bring new insight or leverage. This outcome is typical when somebody picks factors based on a foregone conclusion. Though suggested in a few publications (e.g., Goodman & Karash,1995; Shibley, 2001), I would argue against such approach as it defeats the purpose of finding new interrelationships.

Another way of oversimplifying is the inclusion of solutions in a CLD, such as "implementation of the new HR system" or "new management." Often these are the cherished and untested "shoulds" of one of the diagrammers, rather than a grounded interpretation of observed events. CLDs are much more descriptive than prescriptive. As such, it works best to avoid being overly rational in selecting factors, but to do so on gut feeling – a sense that in some way the top 10 factors are crucial without yet knowing why. The challenge is to piece together how such seemingly unrelated picks fit together into a storyline. This forces discovery. It can be helpful to label the selected factors in a certain way: concise (1-5 words), nouns rather then verbs, variables rather than constants (e.g., no 'demographics') and neutral (e.g., no 'stupid management'). Although such labeling tips in the literature make sense, I have seen powerful diagrams flaunting them, so there is no need to be overly concerned about labeling.

Step 2: Sense a Storyline, Draw Loops, and Fill in the Gaps

Groups sometimes get stuck when looking at a selected 10-20 factors, not knowing where to start drawing. In a way, one can start anywhere; great diagrams are loaded with loops and take a lot of redrawing and fine-tuning. However this advice does not always prevent (beginning) diagrammers from drawing more familiar but dysfunctional shapes. These are a few typical ones: 1) the "tangled web," when all possible connections between the factors are drawn; 2) the "wagon wheel," when people put the factor they feel "it is all about" in the middle radiating outward with connections to all the others; and 3) the disguised "one cause – one effect" diagram, when all arrows come from one end of the paper and they all end at the other. Figure 12-2 is a (simplified) example of the latter, made by a Caribbean provider of a mobile phone network to understand their persistent cost overruns. The diagram fails to shed any new light on the matter and instead just reiterated the existing belief that government ownership was to blame.

Why are these three shapes so dysfunctional? Because they all lack feedback loops meant to explain the systemic characteristics of the issues. It is therefore best to have diagrammers focus on sensing and drawing loops right from the start. Let the first person with a hunch of where a loop might be, draw it as a circle, temporarily forgetting about the other factors. Often that circle is incomplete and other people may pitch in to close it. After one loop is on paper, other loops should be added. Sometimes people have a hard time closing a loop with the factors they selected, even though their intuition tells them that it should. This is the time to add factors to fill in the gaps in the circles. It might seem odd to "invent" them, but it is a good way to find "hidden factors." Limited re-diagnosing can later check their existence. Discovery of feedback mechanisms is in a way the most important part

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of the diagramming process. Given the intuitive and creative nature of such discovery, it is best to build on other's reasoning first rather than criticize right away. There is ample room for scrutiny in the steps that follow. Some people find it helpful to put the factors on Post-It notes so that they can be moved around more easily.
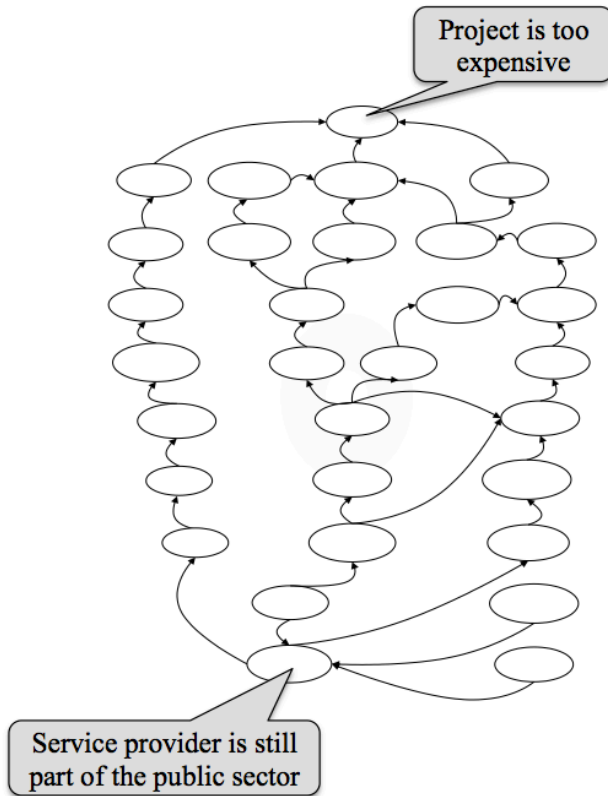

Figure 12-2 A Camouflaged Loopless Diagram

Step 3: Check Arrows for Cause and Effect: "More of This = "More/Less of That"

In the beginning, people regularly mix up sequential thinking where arrows mean "first this, then that" with causal thinking where arrows mean "more of this, more/less of that." Such sequential thinking is all too familiar – we use it when we recount a past sequence of events or propose a plan for the future. The latter generally resembles a stepwise approach like: management shows clear commitment → objectives are agreed upon → program management is put in place → implementation takes place → improved performance is realized.

A good way to erase such sequential thinking from a diagram is to check if arrows are causal – does more of factor X lead to either more or less of factor Y? When the answer is not clearly yes, the relationship is not causal, the arrow is scrapped and the diagram needs to be redrawn to find how the loops might still close. This is where we scrutinize our intuitive labor from the previous step. It can lead to 180 degree reversals of some arrows.

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Another way to clean up a diagram is to focus on sets of factors that are linked by arrows going both ways, implying that they impact one another equally. In this instance, a judgment call is needed with the data in mind as to what is cause and what is effect. For instance, does "job promotion" lead to "learning" or does "learning" lead to "job promotion"? Such decisions are at the heart of explicating what one believes to be the underlying dynamic of an issue. It is undesirable to have the same factor popping up more than once in the diagram as this obscures such explication. Other tips to clarify causality in the diagram are to add the polarity (shown as + or -) and visualize delay effects (shown as --//$\rightarrow$), as illustrated in Figure 12-1. As an example, positive causality between a "personnel performance problem" and "bring in an HR expert" means more of the first, creates more of the second. In a negative causality, more of the first, creates less of the second. Diagrams can, however, be already powerful when foregoing these last drawing tips.

Step 4: Walk through the Diagram; Redraw it as a Recognizable Set of Circles
By this time most people should have a rough diagram in which most of the selected factors are included and some loops are delineated. In these rough diagrams there are generally several things that do not yet add up. Walking through the diagram and telling the story as you go to yourself or team members is a good way to spot those. There are three basic clues to indicate what needs more work:
- *Where you get stuck walking through the diagram*: some arrows are generally not causal at all or are pointing in the wrong direction. Another reason can be that the diagram consists of disconnected parts. The novelist Isabelle Allende pointed out that a good story flows not because of the events but because of the interrelationship between them. So when you get stuck telling the whole story, you need to rethink the loops and link separate diagram parts into a whole.
- *Where you need a lot of words to explain a few arrows*: you need to add a few factors to tell the story. The same is true for important variables that pop up in your story, but do not show on paper. Vice versa you need to reduce detail complexity by scrapping factors in long branchless stretches as they add little to the story.
- *Where causal links seem insufficient to explain what happens*: you need to add causal connections. Effect insufficiency refers to factors that, counter to your intuition, show no or little impact on other factors in the diagram. Cause insufficiency refers to the opposite where the arrows going into a factor do not explain convincingly the emergence of a factor. An example of the latter would be "unclear structure $\rightarrow$ conflicts" where you sense that lack of cooperation skills might play a bigger part in creating conflicts than unclear structures.

Mature CLDs for real life cases generally have multiple loops. Bad aesthetics can, however, obscure such loops, which then get lost in the clutter of the diagram. The art of drawing good-looking diagrams requires a good eye, but there are also some artistic clues (e.g., Moxnes 1984). First, it is useful to redraw the individual loops to stand out as circles. It also helps to minimize crossing arrows and arrows that journey around the paper to distant cousins. Secondly, reduce readability by "unidirectional flow" through each factor. This way

of drawing allows people to see in one glance everything that affects a factor (arrows coming in from one direction) and what it in turn affects (arrows going out in the opposite direction). Figure 12-3 illustrates how these steps can make a difference. Thirdly, in complicated diagrams it can help when separate themes occupy different "corners" of the diagram. Some authors also advocate labeling the type of loop as either "reinforcing" (R or +) or "balancing" (B or -) as shown in Figure 12-1. Some transgressions against these artistic rules are unavoidable, but fortunately still allow for memorable figures.
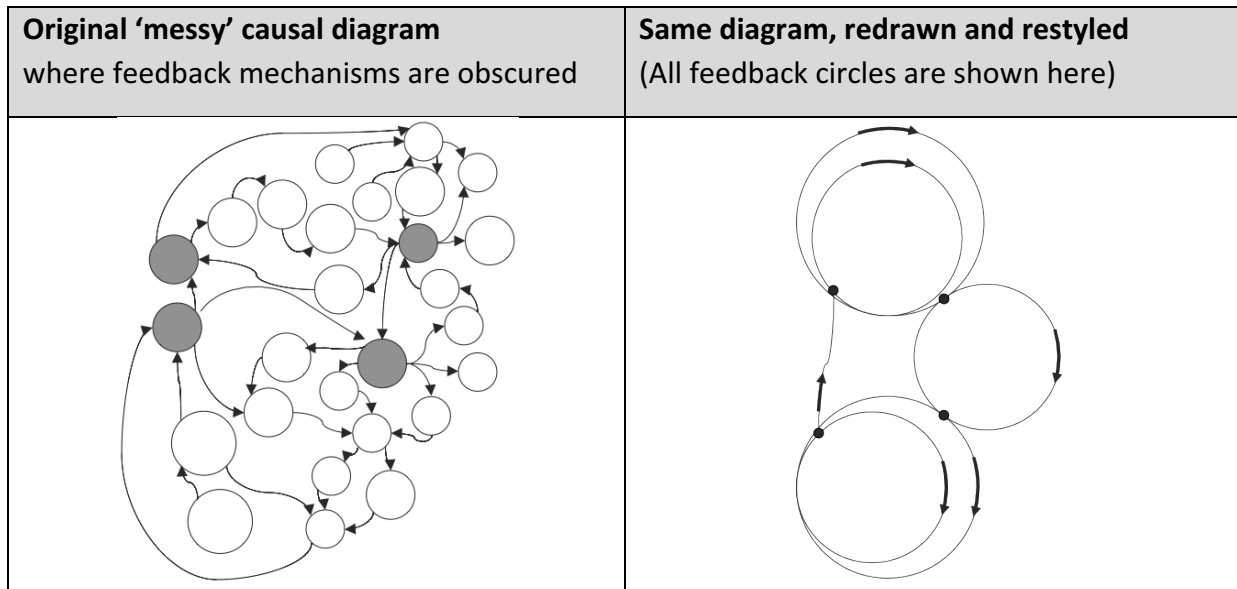
Original 'messy' causal diagram	Same diagram, redrawn and restyled
where feedback mechanisms are obscured	(All feedback circles are shown here)

Figure 12-3 A Redrawn Combination Shape (four key connecting factors marked)

Step 5: Deduce and Discuss Points of Leverage and Monitoring

System dynamics problematizes interventions focused on symptom relief. This pitfall emerges in change efforts where we do not discriminate between points of leverage (where little effort affects system change) and points of monitoring (where little system change can be felt immediately). An apt metaphor to illustrate the relevance of such distinction is how people take a bath – turning the tap is the point of leverage, sensing the temperature with your hand is the point of monitoring. Switching these two around makes bathing a scary and difficult thing to do. In management such confusion is not uncommon. Triggers for change (e.g., "conflicts") or desired change outcomes (e.g., "entrepreneurial culture") should generally be regarded as *points of monitoring* because many things reinforce organizational culture and contribute to conflicts. Change in a system is readily experienced there. However "implementing culture change" or engaging in "conflict resolution" constitutes low-leverage interventions. We can distinguish these points in our diagram:

- *Steering factors*: several more arrows outgoing than ingoing
- *Measuring factors*: several more arrows incoming than outgoing
- *Ambivalent factors*: several arrows both incoming and outgoing
- *Autonomous factors*: little or no arrows incoming or outgoing

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Evidently, the *steering factors* make for the most likely points of leverage, while the *measuring factors* are best suited to monitor progress. *Ambivalent factors* are problematic. One might want to use them as points of leverage, but they are often hard to get a grip on as many other factors influence them. Such "influence analysis" (Probst & Gomez, 1991; Van Reibnitz, 1988) helps change agents escape their preconceived notions of leverage and assess how to make use of the dynamics of the system (see figure 12-4). Doing the analysis mechanically by counting arrows, however, may lead to false conclusions when arrows are of very different strength. I suggest also trying to reason how the *steering factors* create a "snowball" effect in the diagram. When this reasoning does not convince, the CLD should be adjusted by scrapping weak outgoing arrows from the supposed steering factors. Any leverage not yet captured can also be rectified at this point by adding outgoing arrows and possible loops that might stem from them. Sometimes a complication arises when a strong steering factor (e.g., demographic shifts) is out of our control. In such cases it is a point of leverage in theory but not in practice as it is a factor that escapes direct control. The steering and measuring factors can be marked (S and M) in the diagram for easy reading.
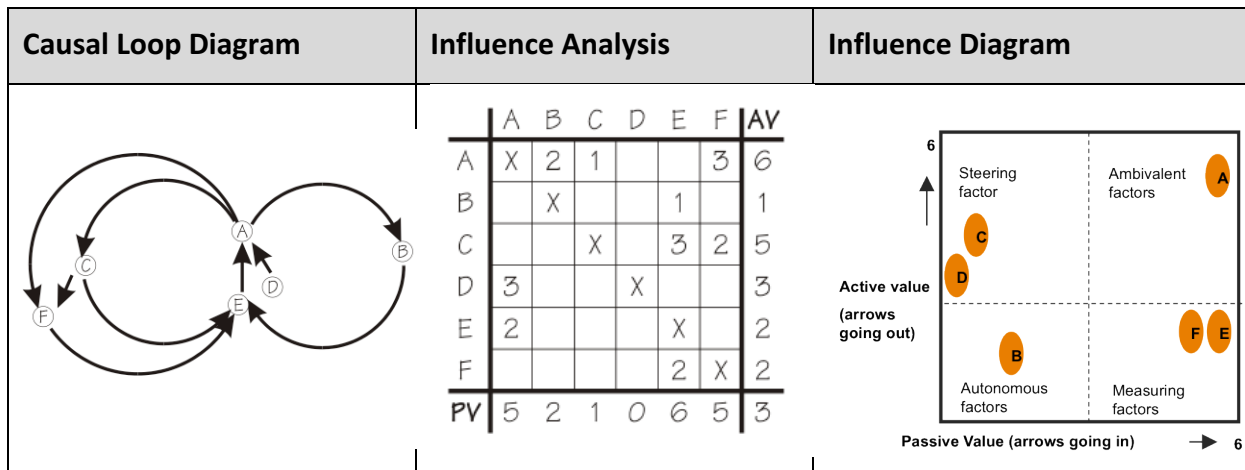
Causal Loop Diagram	Influence Analysis	Influence Diagram

Figure 12-4 Influence Analysis

Post-phase: Testing and Using your Diagram to Affect Change
When different groups construct a diagram of a complex issue, they often come up with (somewhat) different diagrams. This may lead to discussions about which one is true. In a way, none of them are – models are not reality. They are a way to make sense of reality and are subjective by nature. Does this imply the diagrams are all arbitrary? I don't think so. Some diagrams capture underlying dynamics of systems quite well and lead to greater understanding. Others don't. Some diagrams enable people to find powerful action perspectives. Other don't. In other words, the pragmatic usefulness can be tested quite well and used to refine the diagram in an iterative cycle. I would suggest testing it in less intrusive ways first rather than embarking right away on a full-scale implementation program based on an intuited diagram.

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A first way of testing is by way of finding out to what extent the diagram captures underlying dynamics. A simple way is by narrating the diagram to the people involved, finding out if it resonates with them. Often they hold different pieces of the puzzle, so if it somehow links their seemingly different viewpoints it is a good sign that the diagram captures and connects different sides of the issue. A more involved way is by gaming, where conditions are reenacted in a laboratory setting based on the diagram to see if those involved have similar experiences as in the real life case. Computer simulations are also sometimes used for such testing. The advantage of gaming with actual people is that is also has a great educational value as well – they can experience a situation in a compressed time span without the risk of doing any real damage (Duke & Geurts, 2004).

A second way of testing is by using the identified points of leverage to try to affect change. The better the interventions work, the more this "proves" the diagram's accuracy, though this also depends on the ability of those involved to pull off interventions competently. A small way of testing is by experiments in microcosms in people's own working environment. In such a microcosm the same dynamics can be found as in the issue at large. I found, for instance, that intra-office tensions at foreign embassies between local and expatriate staff were a good microcosm for the cross-cultural barriers between Western donor organizations and their partners in developing countries. Figuring out how to make progress in that small setting was a good practice run for trying to address it beyond the organization's walls. Testing on a larger scale can involve creating scenarios and/or action plans to address the issue throughout an organization or community (De Geus, 1988; Von Reibnitz, 1988). When the associated interventions have the impact desired, this again confirms the diagram. If not, the diagram needs to be reassessed. Of course intervening may itself shift the dynamic of the system and thus lead to shifts in the diagram in terms of factors and interrelationships newly emerging or disappearing. Any diagram is thus a feasible representation for a limited time only.

WORKING INTERACTIVELY:
DIAGRAMMING AS INTERVENTION

Making CLDs and testing them are interventions in their own right. Diagramming is not a value free, impact free diagnostic exercise after which the real action begins. It can disturb cherished ideas, empower early adaptors, shift power balances, and so forth. It will inevitably create certain expectations and reactions in its context, even where diagramming is done in the expert mode by a few people in isolation. Onlookers might resent their exclusion, fear its outcome, critique the methodology, or regard it is something "not invented here." In short, diagramming has an impact on two levels: 1) the content level where systemic enquiry happens, and 2) the process level where people are involved in a certain way. Basically, one does not make CLDs only about social systems, but also *within* social systems and *for* social systems (Vriens & Achterbergh, 2006). Recognition of the impact of process choices on the social system has made people critique the default expert mode that dominated the early days of diagramming, where affected parties were scarcely involved. Even (or maybe especially) a perfect diagram rarely suffices to bring about change. It can easily disappear in a drawer, because of political or cognitive defense mechanisms

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(Argyris, 1990). Fortunately, there have been calls within the system dynamics community since the 1970s to work more interactively with CLDs in order to reap greater benefits from them (e.g., Andersen & Richardson, 1997; Lane, 1992). This can inspire change agents beyond this community to include CLDs in their interactive approaches.

Looking at it from this process angle, causal loop diagramming is not *one* intervention. It is more an umbrella term covering widely contrasting interventions – sometimes it corresponds to political negotiations, sometimes to a learning environment, sometimes to expert advice. The toolkit (the diagrams) might be the same, but the goals for which they are used, the way the processes are designed, the types of people that are involved, and the way interaction plays a role all differ. In these respects, using CLDs for team learning shows a greater similarity with the use of inter-vision or dialogue in teams (where no diagrams are produced) than with lots of projects that do utilize diagrams. Similarly, in political decision making you can replace the instrument of CLDs more easily with that of mediation than you can switch to a totally different style of facilitation (e.g., teaching or provoking). The systems dynamics literature increasingly distinguishes between the types of goals and strategies for which CLDs can be used in order to make choices in this regard more deliberate (e.g., Vennix, 1999; Vriens & Achterberg, 2006). This corresponds with similar efforts in the change management literature to create a map and a language for contrasting change strategies, each based on different assumptions, focused on different outcomes and requiring different methods and skills (e.g., Bennis, et al, 1985; Caldwell, 2005).

In my own work, I often use a distinction in five contrasting paradigms, each distinguished by a different color (de Caluwe & Vermaak, 2003). For convenience sake I will cluster these strategies into three main approaches that can be recognized in both areas of literature (Table 12-2). I will briefly characterize each of the three types of change strategies and use a case example to illustrate how causal loop diagramming can play a part in bringing them to life.

	Type of objectives achieved by diagramming	Type of interventions assisted by diagramming
Rationality oriented approach	Robust, valid, situated knowledge	• Scientific analysis • Methodic conceptualization • Expert input
Commitment oriented approach	Sufficient buy in, coalitions, base of support	• Give and take/ fair exchange • Respect for each other positions • Search for commonality, motivating for all
Development oriented approach	Increased awareness and exploration by those involved	• Settings for collective learning • Dialogue and inquiry • Space for play and experimentation

Table 12-2 Contrasting Change Strategies

The Rationality-oriented Approach

The emphasis here is on making a solid CLD in terms of content. Diagrammers make use of a wide array of information and insights, but especially that of experts, to ensure that "reality" will be represented as accurately as possible in the diagram. They do their best to alleviate worries about the incompleteness of the validity of diagnostic information. The main objective is to decipher how the problem fits together and is sustained. The diagram needs to be as precise and robust as possible. Experienced model-builders are generally the ones constructing the diagram – only then do they feel assured that the most important feedback mechanisms are uncovered and represented in the diagram. When issues are not too complex, typically the result is made available to other parties only once the analysis is ready. Diagram construction can be followed by tests and analyses to further enhance its validity. Any action planning preferably has a research feel as well, for instance by making and testing scenarios.

System dynamics publications on methods and techniques are in keeping with this approach (e.g., Burns & Musa, 2001; Wolstenholme, 1992). The more complex issues become, participation will need to increase in order to create a good diagram as pieces of the puzzle are distributed among many and their observations and ideas have to be taken into account. A more interactive rational empirical approach helps to bring in additional information, interpret findings, test storylines for resonance, or even check out implications in small microcosms.

A University College in Demise

As an example of this approach, I was contracted by a university to backtrack how one of its colleges had lost its market position despite previous attempts to figure out the reasons and reverse that. They wanted to know what was behind this persistent downturn. If the situation was salvageable they also wanted to know what strategy to follow. We sifted though piles of data and held many interviews both in and outside the college. It ultimately resulted in scenarios (based on a CLD) that were assessed on feasibility and were presented in a final report with recommendations.

For a long time there had been internal disagreement about causes of and solutions to the loss of market position. The report was to serve as the final word – a "Solomon's judgment." To build confidence in that judgment among the various parties, people had agreed that it should be based on expert analyses and know how. This was reinforced by the fact that it was a science college, where such a rational-empirical approach was part-and-parcel of everyday work. There was little interest in a participative process because it was felt that time was running out for the college. It now seemed more important to make a reasoned decision soon about its future than to facilitate dialogues where its employees learned to accept and integrate each other's perspectives, which they felt could always be done later.

The most important supporting interventions focused on ensuring commitment between each phase and having all the parties agree with the intermediate results before proceeding further. In essence, a kind of "decision funnel" was created where a consensus was brought closer step by step. These phase transitions were the tensest moments, where

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critics searched for errors in the analysis with which they might undermine any conclusions counter to their own standpoints. In the end, the report laid the basis for collective decisions and actions.

The Commitment-oriented Approach

The emphasis in this approach lies on getting people on board to make a change happen. Causal loop diagrams are used to pull diverging interests and standpoints closer together. The main concern is not that the analysis is accurate, but that it is recognized and supported. Only when it resonates with those involved can it form an effective basis for decision making about what needs to happen next. Orchestrated action is considered valuable in this approach; power factions, resistances, contrasting motivations, and suchlike are deemed worrisome. The assumption is that the parties concerned can only accept the views of others if their own views are taken into account – and these different views should in some way be recognized in the diagram. This applies especially to the views of those who are firmly established within the organization.

Forming diagrams thus is a process of negotiation about meanings aimed at commonality. Without that commonality there is little confidence that any implementation will take place. This process of negotiation can sometimes have a political character and focus on key players at the top, but often it will also broaden and attempt to realize a substantial base of support throughout the organization. The "base of support" can have a double meaning in that respect (leaders and/or shop floor). In the systems dynamics literature, the commitment-oriented approach is represented by the strategic forum (Richmond, 1993), models in the policy process (Greenberger, Crenson, & Crissey, 1976), and system dynamics for business strategy (Lyneis, 1999). With increasing social complexity both the number of people involved increases and the extent to which they feel the need to be heard. Of course, coming to a common understanding and direction also requires them to learn to respect where opposing parties are coming from. The change strategy should entice and enable them to do so.

A Leap in Quality at a Large Service Provider

Consultants supported the top 75 people of a large service provider in analyzing and deciding where service quality could take a "leap forward." This was done in four parallel groups – three service divisions and one support division – in two two-day sessions. During these sessions, collective ambitions were imagined and exchanged for each of the eleven types of service that the company provided. Groupware was then used to map out what enhanced or undermined such service ambitions in the eyes of the people in the room. Their statements were structured with the software, displayed on a big screen, discussed and adjusted.

The main aim was not a robust analysis, neither were the consultants invited based on their expertise on the subject. The idea was that the participants should have the most relevant facts and viewpoints based on their previous experience to figure out how to improve service quality. To that end the group's composition was adjusted to enhance diversity (e.g., internal opinion leaders participated alongside senior management). Each session served as a kind of pressure cooker to get the most influential players in the

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company to agree with each other on what drives quality. The supporting interventions were mostly development-oriented. They remained limited as the "pressure cooker" purposefully prevented extensive questioning of assumptions, viewpoints, and so forth.

The findings from all the sessions were bundled together and later discussed with the top 15 executives. That discussion led into a negotiation around the way a company-wide improvement program would be set up. This sounds more like a top down approach than it actually was, because all the comprising parts of this program were basically thought up by the wider group in the previous sessions, and the implementation would also be championed and tailored by that group with respect to their own departments.

The Development-oriented Approach

The emphasis in this approach is on learning and exploring. People can learn quite a bit from a well-presented diagram, but they can learn much more by trying to piece one together themselves. Creating CLDs thus becomes a means to exchange observations, points of view and mental models among those involved. This mutual enquiry serves to make these explicit and clarify them further. Within this context, change agents should pay attention to the quality with which people listen, question, and reflect. The goal is to unblock any learning obstacles such as groupthink or cognitive dissonance. The main concern isn't that the analysis is correct or that people reach a consensus. Diversity is usually not seen as problematic, but as food for thought and incentive for dialogue. It enhances learning within and between groups, which should preferably translate continuously into experimentation. New insights lead to new behavior, and vice versa, in an incremental process. Causal loop diagrams support the renewal on both ends – you make diagrams to increase insight and experiment "on the job" to test them on real challenges.

New insights and new behavior both inevitably influence the dynamics in the organization. In the system dynamics literature such an approach can be seen in "modeling as learning" (Lane, 1992) and in "group model building" (Vennix, 1996). With increased complexity, thinking and acting needs to be coupled ever tighter – issues can only be figured out while addressing them, not by thinking about them beforehand. This implies that agency must be decentered to those directly dealing with the issues at hand. To this end, a development-oriented approach enables a space to play alongside the pressure to perform. Empowerment is the name of the game.

A Moment of Truth for a Polluting Industry Sector

At a conference with representatives from an industry sector with a dismal environmental track record, an interaction pattern emerged similar to that of the "tragedy of the commons," a classic system archetype (Hardin, 1968). A quarter of the group was against environmental measures, while the rest found it difficult to make their products "cleaner" because they feared they would not recover the extra costs if the biggest polluters continued business as usual. Staying stuck in this collective pattern would predictably result in the industry's downfall as a result of either government legislation or displacement by eco-friendly alternatives thought up by other industries. However, this predicament failed to raise sufficient alarm. The penny did not seem to drop. During the next morning I sketched the dysfunctional interaction pattern, checked it with a colleague and fed it back to the

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group. Reactions varied from shock and laughter to denial (the latter mostly among the strongest polluters), but the vicious cycle at least had at last become part of the discussion. We proposed to do a simulation that same day, based on the tragedy of the commons archetype.

During that simulation, the typical dynamics emerged again, life-size, despite everyone's intentions for that not to happen. At the end of the day this recurrence contributed to a willingness to explore other avenues, and the group struggled but succeeded to devise a more sustainable strategy. The representatives agreed to adhere to its first steps during the next half year at which time they would convene again and make final decisions whether to commit to its full implementation. The precision, proof, and perfection of diagrams played a subordinate role in this case – it was not a rationality-oriented approach. What mattered foremost was that the process opened their collective eyes. Supporting interventions were largely commitment-oriented, focused on pulling together as an industry sector behind an environmental program.

Windows and mirrors are classic interventions in a development-oriented approach. *Windows* stands for making people aware of new (theoretical) perspectives; by looking in the *mirror* they become conscious of the (practical) impact their actions. In work conferences, I regularly (have people) use small causal loop diagrams to both these ends. The diagrams help to capture hidden dynamics in a group's practice and allows for collective reflection on them. Any new perspectives that emerge can serve as a stepping-stone to steer those processes in a more constructive direction. The case illustrates this process for a small setting, but development-oriented approaches with CLDs can also be large scale (e.g., see Stoppelenburg &Vermaak, 2009). In cases where participants construct, share and discuss their own diagrams, the learning impact can be even more substantial as this allows participants to not only harvest more insights, but also build systemic thinking and diagramming skills.

Figuring out Effective Change Strategies

Issues come in different shapes and sizes – a reality that is fortunately also true for approaches to change. The challenge is too choose what fits the situation best. Is knowledge creation the key or is it more important to have buy-in from those involved? Or perhaps what matters most is empowerment? Choosing an approach requires weighing the pros and cons, because sometimes the change strategy the organization is best at implementing is not the one most appropriate for the issue at hand. March and Olsen (2004) describe this as a "logic of appropriateness" versus a "logic of consequentiality," Here I would advocate consciously selecting and crafting such a change strategy. In most organizations – and in most diagramming practices – approaches oriented toward rationality and commitment dominate over those oriented development, regardless of how well they work. This imbalance should be rectified, especially around complex issues where development approaches often make good sense. It does, however, require putting in extra effort to successfully pull off a less familiar approach given that associated ideas, interventions or competences are less familiar. Without this extra effort, there is a real risk of creating disappointing outcomes, which only reinforces barriers to using a development approach in the future – a sure way to undermine contingency thinking.

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Situational choice for a change approach implies separating such processes and switching between them. Sticking to any one approach indefinitely is not an option. Neither is indiscriminately mixing them together as this undermines each of the approaches. An example of this might be if, for instance, you mix a political process (geared towards commitment) with a learning process (geared towards development). In a learning process, participants gain the most when they show their weaknesses, ask for help, experiment with things they are not so good at, and so forth. In essence, people "put their cards on their table." By contrast, in a political process such behavior is generally dysfunctional and damaging, undermining people's negotiating position and making them vulnerable to attack. In such a context keeping your cards close to your chest makes more sense. Such contrasts are abundant between change strategies. The more you honor, use and maintain such contrasts, the better each of the approaches work (Vermaak, 2009).

This "separating and switching" can, in a limited way, also be observed in the case vignettes provided in this chapter. The least intensive way to achieve this functional way of combining change approaches is by having one overarching strategy be supported by a contrasting one. This happened in all three cases presented above. Sometimes it takes shape as brief contrasting intermezzos, like "commitment" phases interspersed in the predominant change strategy in both the university college case and the polluting industry case. Sometimes the support takes place through a supporting role, like some learning interventions in the service provider case to assist people to really hear each other and look for connections between their ideas. The more complex the cases are, the more intensive this switching between strategies needs to become so as to effectively address many different aspects of the issue at hand. Elsewhere I have described how such rapid (paradoxical) shifts can enhance the impact of causal loop diagramming (Vermaak, 2007).

Dealing productively with the tensions between contrasting change strategies is an intriguing topic that I only touch on here, but is crucial to living organizations (De Geus, 1997) and break through innovations (Vermaak, 2009). As change efforts are generally collective efforts, a first prerequisite to separating and switching is a common language to distinguish different strategies and what constitutes them – which is an extra reason to introduce such distinctions here.

CLOSING REMARKS

The consultancy market has shifted over the years. Many clients have gained know how about change management and are quite able to tackle basic changes themselves without the aid of consultants. In times of recession they do exactly that in order to cut costs. A more sustainable business proposition for consultants is to provide services that clients are as yet unable to insource. This tactic also makes sense from an organizational development perspective as it allows consultants to build clients' change capacity to deal with more complex change. As an added bonus it creates a strong impetus to innovate our knowhow, our services, and our skill set. I believe that CLD provide a robust method to deal with content complexity and process complexity that fits this shifting role for consultants. At the same time, it is important to emphasize that CLDs are not a cure all for all change issues.

When issues are simple or require limited participation, not only do we as consultants have less and less to add, but the CLD process takes more effort than it is worth.

Another point to make is that complex issues have the awkward tendency to raise anxieties among those involved. This can lead to a reflex to circumvent uncertainties even though they are intrinsic to complex issues and to the innovative approaches needed to address them. Taking on the expert role as consultant plays into this trap. The more consultants suggest they have the answers, the more this seems to discharge others of responsibilities to find them (Gabriel & Hirschhorn, 1999). The more consultants suggest they are especially competent to implement them, the more the effort is outsourced to them. Neither is productive. As complex issues are often interwoven with the primary process(es) of an organization, they require active participation to address them. Temporary setbacks and pitfalls are part of that process and even desirable for people to find out what works and to master what is needed to bring about lasting change (Geschka, 1978). Inevitably the expert mode sooner or later disappoints. It adds to participants loosing faith in dealing with complex issues and leads to consultants loosing their credibility. Such dynamics are part of any helping relationship and handling them is at the heart of the consultancy profession. These dynamics play out especially strong as soon as issues move beyond our personal understanding and control.

In such cases there is a need to have two conversations at the same time: one about constructive ways to address the issues and another about the anxieties that emerge. French (2001) labels the first as "positive capability" and the second as "negative capability" – and then states we are doomed when we lack either. Fortunately, causal loop diagramming can assist both those capabilities. *Positive capability* requires coming to grips with content complexity. There is a need for diagnostic probing, for uncovering feedback mechanisms, and deducing points of leverage to address the issue. *Negative capability* requires an interactive "holding space" where tensions and anxieties can be understood, filtered, and handled (Hirschhorn, 1988). This is where learning dips and political frictions are addressed. The space is "contained" in order for them not to eclipse the rest of the work (French & Vince, 1999). Neither of these processes are quick fixes and the diagramming process helps to slow participants down sufficiently to get to grips with both.

Consultants that deal with complex issues have no choice but to escape the "know it all" mindset and embrace the role of facilitating both analytical rigor and interactive sensitivity. Such role is a paradoxical combination that can be quite challenging for consultants. However, it might be the only way to make sense of ambiguous situations and persistent problems. Such a shift in consultants' expert identity is, in my view, hardly viable if capabilities and instrumentation are incongruent and do not support such a shift. Causal loop diagrams are a good exception as they too are a brainchild of contrasting worlds. When it comes to consulting for change, CLDs have proven their worth for decades in bridging both worlds. What remains is for more consultants to get over their vacillation, to become more skillful in using them, and to bring out their full potential. The aim of this chapter is to lend a hand in these respects.

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