

# The Science of Systems

## Southwest CAPTalizers

CSAP Center for Substance Abuse Prevention

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**CAPT**

APPLYING PREVENTION THAT WORKS!

The birth of a new millenium provides a unique moment to pause for reflection on how people and the surrounding world have changed. Over the past 1,000 years the changes have been dramatic, often profound, and occasionally punctuated by climactic shifts in the way people perceive themselves and the world.



One dramatic and far-reaching change in worldview came in the 17<sup>th</sup> century with the work of Isaac Newton. At the time the rational, deductive method supported by René Descartes was perceived as conflicting

with the empirical, inductive method of Francis Bacon. Newton successfully bridged the two opposing trends to develop a methodology that has been the foundation of natural science ever since. Over the centuries, this worldview has become deeply rooted in Western thinking. It has grown to become the underlying, transparent and prevailing worldview, reaching beyond science into the ways people consider almost everything.

In the first three decades of the 20<sup>th</sup> century there was another dramatic shift in scientific thinking not unlike the shift in thinking associated with Newton in the 17<sup>th</sup> century. This shift emerged from the field of physics. A group of scientists focusing their efforts on the atomic and subatomic world found that the mental models, e.g. the ways of thinking and methods of inquiry based on the principles of Newton's science, did not accurately describe nor reflect what they encountered in their experiments. The interactions they observed were far more complex and variable than previous scientific observations. Through decades of

*No problem can be solved from the same consciousness that created it. We must learn to see the world anew.*

*Albert Einstein*

study and application, these understandings have expanded to reveal a more natural and interconnected way of thinking about the world and, about ourselves.

Albert Einstein once noted that the most helpful single event in developing his Theory of Relativity was determining *how to think about* the problem. As scientists engaged in discovering how to consider and apply the learnings of this newly found subatomic world, the mainstream population was still engaged in applying Newtonian principles and continuing to behave without the advantage of this new found knowledge. The two views are subtly and profoundly different.

**Newtonian Worldview**  
If matter is composed of "things" . . . then,

- The world is a clockwork machine.
- We understand by dissection.
- Knowledge is structured in pieces.
- Organizations are structured as functions.
- Work is structured as roles.
- People are narrowly skilled.
- Motivation is based on external forces.
- Change is the troubling exception.

A background image for the Newtonian Worldview section featuring a map, gears, and a clock face.

If you follow the influence and assumptions of Newton's science, it becomes evident how Westerners, over the course of time, have come to understand the world and how it works. For example, if indeed the world is preset and definable, then all things are lying in wait for discovery. Scientific approaches then work diligently to reveal the laws of nature and apply them. Through this lens, knowledge is gained by breaking the object of study into smaller and smaller pieces, examining each piece in order to understand the whole. A vast number of entire disciplines and areas of specialization have emerged from this way of thinking. Consider for a moment the number

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of disciplines and specialty areas in the health care field alone. (Just glance through the yellow pages under “physician.”) The machine model, also known as the reductionist model, has become *the* guide for how to think about almost everything—including the family, workplace, and social structure.

While an immense amount of knowledge has been gained from studying the world in this way, perhaps the most important thing learned is that knowledge derived in this way, while useful, is incomplete. All the other sciences have been busy trying to be as precise as physics, while physics has already turned the corner and now values relationships (relativity) more than precision.

***How we think about the world guides not only what we see but also how we act and what we become.***

## Time yields more tools

Psychologist Abraham Maslow is noted as having once said that when the only tool you have is a hammer, every problem begins to resemble a nail. Having only one way with which to view the world is similar. What if the world is not a great machine? What if everything exists in relationship to everything else and a change in one place creates change in others? Rather than breaking a problem or opportunity into small pieces and then isolating the pieces in order to study them, perhaps it is more useful to study the entire problem or opportunity. In this way patterns, trends, and systems emerge providing an opportunity to consider both the intentional and unintentional consequences of actions to be taken. It is far easier to get caught in the reactive trap of addressing symptoms when one is focused on a small part without the context of the bigger picture.

**Quantum Worldview**  
 If “things” exist only in relationship . . . then,

- The world is a great thought.
- Parts are understood only in terms of the whole.
- Knowledge is seamless.
- Organizations are whole systems.
- Work is flexible and boundaryless.
- People are multi-skilled and continually learning.
- Motivation is based on the connectedness to the whole.
- Change is all there is.

Using this model as a guide, everything known exists in context and in concert with everything else — nothing exists alone. Everything, and hence everyone, is affected by the environment — physical, mental, psychological, political, social, and spiritual — that encapsulates us. Families, communities, and organizations are all open, flexible, changing systems rather than isolated, closed, machine-like entities. People become motivated when they perceive themselves as a part of something greater. They are dynamic, in a constant state of becoming, so engaging them in a process of continual learning is more effective than periodic detached training sessions. Studies indicate that continual learning is how 70 percent of on-the-job learning takes place. By using this model of thinking, change becomes a natural process not a dreaded intervention.

Consequently, how we think about the world (our mental models or worldview) guides not only what we see but also how we act and what we become. Continuous learning increases the likelihood of innovative and creative approaches to solving problems and embracing opportunities.

## A different mental model

This quantum worldview has shifted the mindset from thinking of systems (and people) in mechanistic terms to thinking of systems (and people) in terms of relationships. That is, when considering a problem, a challenge, or an opportunity — what is the relationship

# The Science of Systems

to the whole? Rather than isolating a portion of what is known or questioned, we look for emergent *patterns* of behavior and *underlying conditions* supporting the behavior. Applied, this kind of thinking allows for including and considering many variables and for systems to change more readily and naturally.

Recall in the not-too-distant past when space for landfills became a problem. Many were quick to attempt to locate more space for landfills while others were asking more probing questions.

Defining the problem became the problem — was lack of space to put the garbage the problem? Or perhaps there was more — an underlying condition that created increasing amounts of garbage? Out of this kind of thinking came the reduce, reuse, recycle approach.

Through emergent learnings, like this one, we have come to understand one of the principles of the science of systems — there is no “away.” In other words, there is no place on the earth to discard things permanently. Everyone’s backyard is our backyard and ours is everyone else’s.

Systems thinking attempts to reveal the conditions supporting the problem or symptom rather than simply reacting to it. Systems thinking considers all the intricately woven factors and influences impinging upon the problem, issue, or opportunity and allows examination of how each relates to the other and interacts as a whole.

When exploring a whole system, nothing is considered irrelevant. Intuition is as important as rationality. Therefore, both scientific and artistic approaches are necessary. To examine whole systems requires considering material and spiritual needs, the small as well as the large, what is felt as well as what is thought, what is perceived as well as what is imagined.

Whole systems are dynamic. They change, move, develop, and grow. Traditional attempts to understand through a mechanical systems mindset requires a stop-action snapshot, a frozen image in time that depicts how things are in order to determine what they should be.

Quite often by the time solutions are determined, the problems have changed. While this traditional way of thinking and examining systems can be somewhat useful, it is incomplete.

## A closer look at systems

Once upon a time, not so long ago, systems were studied strictly as closed models. These models *assume* that *all* influencing forces affecting the system are included in the model or if not included are irrelevant. This assumption

allows for calculations that are extremely accurate and for precise and specific statements to be made. However, a problem lies in the *assumption*. Scientists (and the rest of us) have come to understand that, most often, it is simply impossible to account for all

influencing forces and make definitive generalized statements.

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From this understanding of the complexity of the world sprouted systems thinking — a complex web of relationships, of integrated wholes — that cannot be understood by separating, isolating, and reducing to its smallest parts. Examples of this kind of system are abundant in nature—cells, tissues, and organs—each interacting in relation to the other. Social systems can also be viewed in this way. Anthills, beehives, and even human families and communities are examples of systems. Like any thinking, it takes application to determine usefulness and accuracy. It also takes time for the value of the evidence and mental models to emerge in ways that reach beyond science into terms in which the layperson can find relevance and meaning. A quick scan of bookstore shelves reveals that the principles associated with quantum physics, chaos theory, and self-organizing systems are reaching the general public. Books from business, economics, environment, anthropology, engineering, organizational development, culture, are reflecting systems principles.

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## Systems Principles

How does one begin to think, see, and act through a broader and more complex perspective of the world? The following are a few systems principles to help you get started.

1. Everything is connected to everything else.
2. Because all things are connected, you can never do just one thing. There are always consequences (intended and unintended).
3. There is no “away.” You can move things around but there is no place on the planet to throw things away.
4. Always look for a natural solution to the problem.
5. Beware of false assumptions. It’s not only what you don’t know that can hurt you; it’s what you DO know-that isn’t so, that does real damage.
6. The quickest way out of most any situation is likely the quickest way back in. Direct and seemingly obvious solutions often do more harm than good.
7. There are no simple solutions. When the solution seems simple or obvious, watch out.
8. Look for high leverage points rather than taking quick low leverage action.
9. Nothing grows forever. To everything there is a season.
10. Don’t waste your time and energy making rules that can’t be enforced.
11. It is most effective to change the rules so that it is to people’s advantage to make the choices that are good for the whole.
12. Good intentions are not enough. A good intentioned yet uninformed person can cause disaster when following his/her heart without using his/her head to try to understand the whole situation.
13. If you cannot help people become self-sufficient, your assistance does more harm than good.
14. There are no final answers.
15. Expect patterns, cycles, and trends but don’t be fooled by them. It is important to have enough distance to be able to see them in order to understand them.
16. Too much of a solution can be as bad as too little.
17. Just because it works today doesn’t mean it will work tomorrow. Change is inevitable.
18. Today’s solutions are tomorrow’s problems.
19. It is better to take educated actions than no action at all.
20. It pays to look ahead. Solutions to problems in complex systems usually take time so anticipating forces and influences on the system help to prevent problems prior to a crisis.
21. Involve everyone who will be affected by a solution/ decision as early in the process as possible.

## Relevance to Prevention

What does all this mean to substance abuse prevention?

It has been said that the real difficulty in changing the course of any enterprise lies not in the development of new ideas but in escaping old ones.



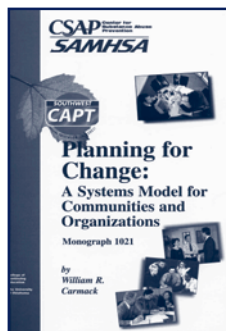
# The Science of Systems

As with so many other fields, the field of prevention is only beginning to make the connections with the impact of the new science and principles of systems thinking. Many bedrock prevention principles resonate with the systems principles noted herein. Notice the importance of systems thinking when considering: involving everyone affected by a project or policy; underlying causes that require long term solutions; and capacity building toward self sufficiency or sustainment. The opportunity to consider and apply this model of thinking is timely and potentially pivotal in the discussion and development of effective long-term prevention initiatives.

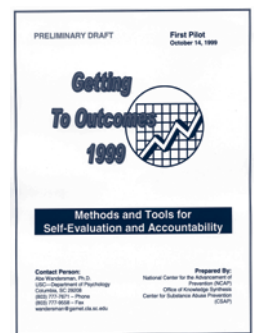
What impact will this have on the field of prevention? How will it alter the way preventionists think about, talk about, and do the work of prevention? Only time, experience, and continued exploration will tell.

It has been noted that there is no one authority in the field of systems thinking. Fortunately no individual or discipline has emerged to monopolize or become specialists in it. There is no standard curriculum. This fact leaves systems thinking as a mental model — a way to think about the world and how it works.

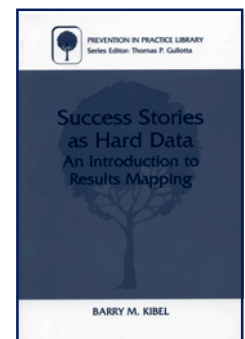
While many of the guiding principles of systems are being applied in the field of prevention, overall the field is in the early stages of intentional discovery and application. Dr. William Carmack, in his monograph titled *Planning for Change: A System Model* (1994), describes the usefulness of considering change initiatives within the context of systems thinking. Included in his discussion are three primary and complementary types of change strategies — education, power, persuasion — which, when used in concert rather than independently provide leverage for achieving a higher level of success. He also discusses assumptions underlying planned change initiatives, the forces influencing change, the process of change, the qualities of a change agent, and evaluating change. His work continues to provide guidance for many groups, organizations, and programs.



The Center for Substance Abuse Prevention's publication *Getting to Outcomes* blends traditional measurement methods and tools for program evaluation into an open systems model. The material guides the reader through an empowerment evaluation model by addressing 10 questions that include the fundamental components of program planning, implementation, evaluation, and sustainability.



Author and researcher Barry Kibel has recently published an innovative evaluation model and supporting methods for open-systems program evaluation called Results Mapping. His work introduces “new science” into the field of program evaluation including prevention programs. It has been praised by many as a milestone in evaluation methodology for program accountability and program improvement. Others consider it complementary to traditional evaluation methods and still others find it difficult and cumbersome compared to traditional evaluation.



## Getting Started

In getting started with systems thinking, consider each of the principles listed earlier and test them by asking yourself — if the principle is true then what does it mean to our prevention effort(s)? How would our actions change to reflect the principle?

**Perhaps the most helpful single event in reducing substance abuse is in determining how to think about the problem.**

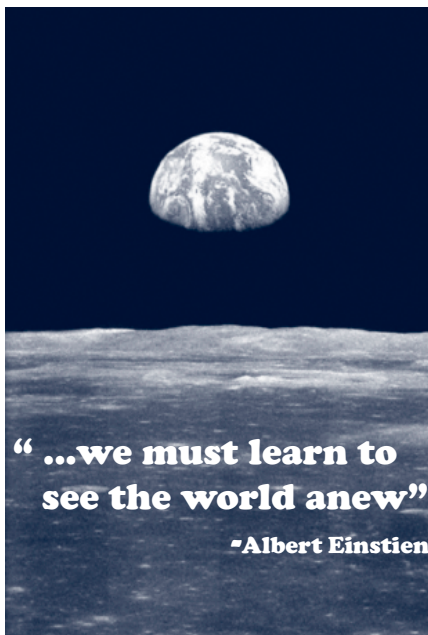
As substance abuse prevention professionals and practitioners, it is healthy and desirable for us to collectively engage in learning about and applying systems principles.

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Our ongoing dialogue, learnings, and experiences provide the kind of nutrients needed further develop the discipline of substance abuse prevention. Additional information and materials are posted on the Southwest CAPT website. You may also contact staff via phone, email, or U.S. mail.

Perhaps, similar to Einstein's realization will be the realization among those in the substance abuse prevention field that the most helpful single event in reducing substance abuse is in figuring out *how to think* about the problem.

The systems thinking approach supports considering problems, issues, and opportunities in a flexible way that envisions the "big picture" while taking into account multiple smaller focus areas. The approach allows for responsiveness to changing conditions through readily incorporating new data, information, and learnings. While the approach is new to many in the prevention field, the learning foundation it is built upon has been growing for more than 70 years.



## To obtain copies of the books mentioned in this document:

*Getting to Outcomes: Methods and Tools for Self-Evaluation and Accountability.* Written by Abe Wandersman, Ph.D.

Contact: CSAP's Southwest CAPT at (800) 853-2572.

*Planning for Change: A Systems Model for Communities and Organizations.* Written by William R. Carmack, Ph.D.

Copies can be received by contacting CSAP's Southwest CAPT at (800) 853-2572.

*Success Stories as Hard Data: An Introduction to Results Mapping.* Written by Barry M. Kibel, Ph.D. One of the *Prevention In Practice Library* Series.

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# The Science of Systems

## Companion reading from CSAP's Southwest CAPT

The Southwest CAPT, a project of the Center for Substance Abuse Prevention, Substance Abuse and Mental Health Services Administration, is committed to a LOGIC MODEL that encourages systems thinking relative to prevention planning. It provides a framework for examining behaviors and the patterns, trends and individual attributes that support behaviors of concern.

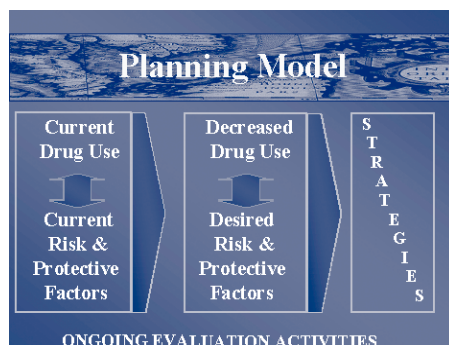
Through an inclusive process, communities examine the existing and desired behaviors as well as the underlying conditions that support each. Communities can then take an informed, proactive approach to develop strategies that intentionally transition from

the current conditions and related behaviors to the desired ones. The model encourages review of the positive and negative, the risk and the protective factors, that influence behavior.

This process contributes to selecting the most relevant and effective strategies for positive change while allowing for adjustments based on continuous evaluation and synthesis of the learnings. The actions taken based upon this process become systemic rather than symptomatic.

This approach is particularly relevant and important for policymakers and prevention oriented agencies as they seek to develop effective substance abuse policies and responsive, meaningful service delivery systems.

(For more material on the LOGIC MODEL, see CSAP's Southwest CAPT CAPTalyzer by that title. Southwest CAPT also provides learning experiences including presentations, trainings, and technical assistance using the Logic Model as it relates to prevention, evaluation, and program planning.)



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The Southwest Center for the Application of Prevention Technologies (CAPT) is a program of the Southwest Prevention Center, Public and Community Services Division, College of Continuing Education at the University of Oklahoma. The Southwest CAPT is one of six regional centers funded by SAMHSA's Center for Substance Abuse Prevention (CSAP) to form the national CAPT system, with a fundamental mission of bringing research to practice.

The Southwest CAPT serves a nine-state region that includes Arkansas, Colorado, Kansas, Louisiana, Missouri, Nebraska, New Mexico, Oklahoma and Texas. The Center functions as a diffusion mechanism for knowledge transfer and research application, linking scientifically defensible research to prevention practice in the Southwest region. For more information about the CAPT, contact us at 1-800-853-2572 or visit our web site at [www.SWCAPT.ORG](http://www.SWCAPT.ORG).

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