Translating Systems Thinking for People in the World of Business

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New ideas are being implemented in businesses today with little thought being given to the philosophical and emotional shifts that everyone in these organizations must make if American business is to succeed as an industrial power.

For programs such as continuous improvement, peer review, team concept, and total quality management to succeed, an understanding of systems thinking and system dynamics is necessary. It is at the root of these philosophical shifts. Business needs people who can translate a complex, technical and sometimes frustrating subject. This requires innovative and creative ways of teaching adults at all levels in the workplace.

This paper deals with some of these methods and brings together a list of resources that have proven successful in communicating these ideas.

Translating Systems Thinking for People in the World of Business

This is not a paper; rather it is a story. And much like Snoopy's proverbial, "It was a dark and stormy night", is being penned by a layman - but a layman who believes that communicating and teaching system dynamics are essential for the successful future of American business.

This is an effort to share the lessons learned; to share the materials that have been useful; and to begin the dialogue as to how experts and laymen can move these ideas and concepts into the hearts and minds of those in need of the technology.

Achieving the full potential of this discipline requires that these ideas reside within the organization. Changing the structures in business requires changing the mental models of business. This means changing the mental models of employees and thereby shaping the culture, the context, within which the decisions of the business are made.

Signs are all around that support the need for this broader application of system dynamics. First of all, today's new programs (continuous improvement, total quality, self-directed workforce, quality of worklife, high commitment teams, labor management cooperation, team concept, peer review, gainsharing) have a whole different implication than the ones of yesterday (management by objectives, strategic planning, bottom line management, scientific management). These new programs imply the whole system doing something about the whole system. No longer is the leader the sole implementer and thinker. Now everyone is expected to think and act, often independently, while on the job; and that means the whole system better understand those forces at play - those characteristics and patterns that exist in dynamic systems.

One leading expert in designing and implementing whole system problem solving has described this shift as being an evolutionary process of business problem solving (Weisbord 1987,262).

He states that when solving problems in business, there are two questions that must be asked - what problem will we solve and who will solve it? To answer these, a leader can place his strategies at different points between two extremes.

What do we solve?

An isolated problem ——————————————— The whole system

Who will solve it?

The expert (manager, engineer, consultant,etc.) ——————————————— Everyone

The left side has the advantage of being faster for the short term and the right side has the advantage of instilling ownership and locating more effective solutions. When in a crisis situation, business leaders often must and should operate to the left. For creating change, operating on the right side offers the organization the best possibilities for long term success.

However, the problem for business is that the ways of answering these two questions have evolved over the past decades from one extreme to the other. The first evolutionary phase was to isolate the problem and ask the expert to solve it. Detailed problem solving techniques to break large problems into discrete smaller parts surfaced. Leaders believed that

once the pieces were solved and aggregated, the whole would be solved. The process was discredited as the expert went away and the problem resurfaced, often with a vengeance.

Next, everyone was asked to solve the problem. The quality circle movement emerged with it's problem solving techniques for everyone in the organization. However, those who experimented with quality circles in the late 70's learned hard lessons about adopting ideas from other cultures which ask employees to think for only one hour a week.

The third evolution saw the rise of experts working to improve the whole system - system dynamics experts and large consulting groups that lived with a client to provide whole system solutions.

The fourth evolution is now beginning - asking everyone to improve the whole system. Efforts currently in progress are a manifestation of this. Labor/management teams on quality of worklife, self-managing teams, decreased layers in management, personal computers for everyone, and pay plans that are based on business performance which reward the group rather than the individual are only a few examples of these efforts. It is this fourth evolution that highlights the problem - everyone can not improve the whole system without understanding the context within which they are working. Methods to translate and communicate the language and concepts of the system dynamics expert to that of the person working on the factory line and in the office are difficult to locate. It is now time to include the entire workforce in teaching efforts aimed at communicating these concepts.

Creating a common language for the entire organization is also necessary. Having people challenge themselves and search for "goal erosion" or "long term trade-offs" , "shifting burdens" or "leverage" are clear signals an organization is changing perspective and mental models as well as becoming self-policing of it's own behavior.

A second reason for the need to translate system dynamics for the layman, is a frightening sense of powerlessness that exists in our organizations. No one - from congressmen to the President, from the mayor to the school superintendent, from the student to the CEO, the manager, or the employee - feels he can make a difference in today's environment.

A cycle of blame so many have been riding has fueled this sense of powerlessness. Few rise above it and believe their actions really count for something. Many people, at all levels in the organization, still believe the fairy tale that someone is in charge - that someone has a plan and if found will save the organization. Current structures support this myth and encourage people at the bottom of the hierarchy to become dependent on the "hero" manager while those at the top of the hierarchy believe they are completely responsible and must somehow save the system. When actions for change are unsuccessful, finger pointing and blame can grind the system to a halt and prove, once again, how powerless and needy the system is for someone with THE answer.

As this cycle plays out, people take a wait and see attitude. Those at the top are waiting for employees to change and employees are waiting for middle managers to change. And everyone believes that change means others must do the changing, not themselves. If this is the scenario - where and, more importantly, when will real change happen in organizations? Understanding complex systems and the dynamics at play can move people away from this sense of powerlessness and toward a greater sense of power with a belief that, "I can make a difference."

To build whole system understanding and to counter this sense of powerlessness, experts must integrate system thinking and, quite possibly, system dynamics, into organization training and consulting at all levels. However, in turning to management articles, business reviews and existing training materials (for example, games, videos, exercises, simulations, case studies) there is little available for the manager and almost nothing for the machine operator or secretary.

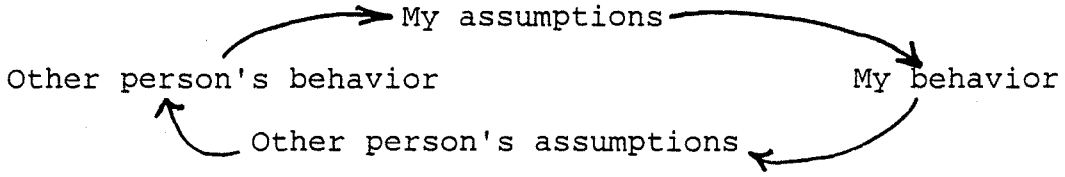
Sharing a STELLA model (High Performance Systems,1987) or a DYNAMO model (Richardson,1981), with a free wheeling entrepreneur or a machine operator on the midnight shift is not furthering the discussion around system dynamics. Neither is it helping them realize the ways this technology can help.

This technical and very complex subject which is necessary for the general population has few accessible materials to assist in the learning process. This realization left me with little but a personal vision - to be a translator of this complex subject. In pursuing this, I have learned several important lessons:

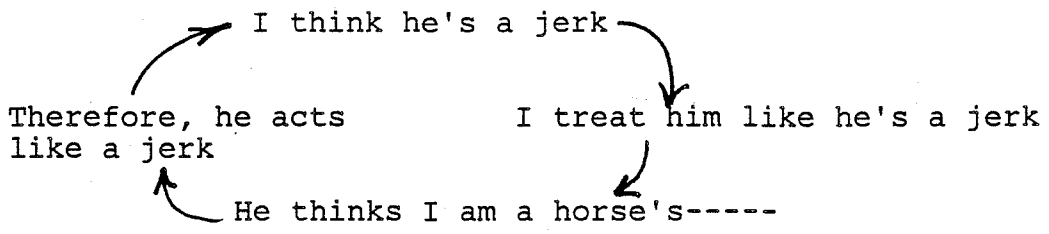
Lesson 1 - Recognize different audiences and develop focused appeals.

The CEO, supervisor, secretary, technical contributor, machine operator, and engineer not only have very different job requirements, they are very different in personal values and needs. Consequently, they need to learn different aspects of the subject. Excluding any group from a basic understanding of how system dynamics operate will harm the process in the long term. Machine operators on third shift will never build a computer model but their input is essential if the model is going to reflect the true system. This input will only be enhanced by an understanding of the philosophy behind the model.

Feedback loops can be helpful here - especially ones that tell stories that people can appreciate and help to build. Douglas McGregor's Theory X/Y provides an example (McGregor, 1960):

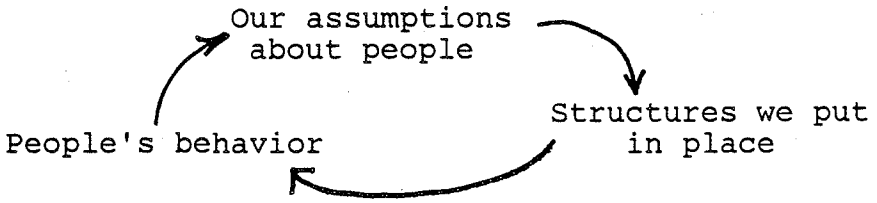


Based on a discussion of feedback, a machine operator built this loop:

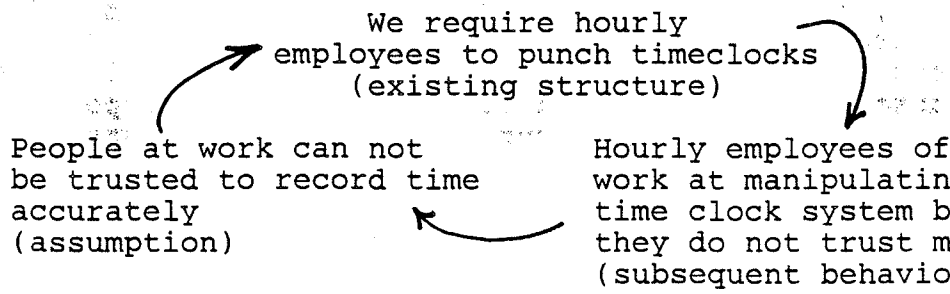


While not necessarily a loop that executives would relate to, the message here is clear - if I want to change his behavior, I test my own assumptions first and in the process increase my own power to act.

Supervisors and managers relate to this loop not only in diagnosing individual and management behavior but also in diagnosing structures needed to support new programs:



When managers challenge their assumptions regarding existing workplace structures and the subsequent behaviors generated in the organization, significant learnings can take place. For example (Ken Murphy, Union Carbide):



This is an assumption that has driven a system behavior for generations and managers are just beginning to ask if this old assumption supports new behaviors!

These kinds of loops or similar ones are very familiar. However, the use and application of feedback loops for all levels in an organization has not been appreciated. When used as a teaching tool that develops spontaneously from discussion, the idea grows that cause and effect are related in a non-linear fashion and that it is possible to locate leverage

in the system. Once the concept of leverage is grasped, people begin to move toward creating the future rather than solving discrete pieces of the problem. Their own sense of impacting the future begins to grow and any project involving modeling can move forward with more appreciation and understanding by all involved.

These messages can be very powerful when presented in the form of feedback loops; but, they must reflect the values and needs of the audience as they truly are and not what we teachers and consultants want them to be. Further examples of techniques to develop focused appeals are listed in Attachment 1.

Lesson 2 - Keep the messages simple.

This simple and self explanatory idea has been one of the most difficult. Jargon abounds in system dynamics. The more technically literate people become, the more they tend to rely on technical words to convey messages. For example:

A structure of interacting variables
Reductionistic versus holistic thinking
Policy resistance
Compensating feedback
A new paradigm
Open system, input and output
Computer modeling
System dynamics

These words are often viewed as jargon and can cause people to tune out and turn off to ideas before they recognize the value of those ideas. The danger for experts and laymen alike, is that, at some point, the words are no longer perceived as jargon. No one wants to be condescending to an audience but neither can the expert afford to assume that others understand or that the jargon will be helpful in explaining the ideas.

The key learnings and messages for most groups can presented in a simpler language:

"Basic patterns exist in all systems. We can learn those patterns."

"Systems behave as they do because they are built that way."

"Unintended consequences are everywhere and sometimes can even be avoided."

"Influence increases as we impact structure. We can learn our structures."

The danger in keeping the teaching of the ideas simple is

that people can confuse the message delivery and the message. This is a complex subject that has been intentionally oversimplified for the purpose of learning. The burden now resides with the instructor to peel back the layers of the onion deep enough for any particular audience.

I have learned some wonderful stories from participants that help in this:

"Leverage is my mother bringing me to my knees with a few words like: 'Is that all?', 'Remember me?', 'You haven't called recently' or 'So?'."

"Synergy was the 1988 LA Dodgers. The sports writers failed to predict their success because of a belief there was very little individual talent on the team. Reductionistic thinking is reflected in George Steinbrenner's hiring policy for the NY Yankees - pay the most money for the best talent but do not worry about the ways the parts fit together!"

This quick understanding of some of the concepts of systems thinking has lead to lesson three.

Lesson 3 - People in business intuitively understand bits and pieces of systems theory.

However, the various concepts of system dynamics in the business world have never been aggregated for them to study as a theory so they can build their own mental models of the concept and apply the theory on a day to day basis.

Experts can build on this knowledge. A bridge to this knowledge is created by saying to the right audience, "Remember Douglas McGregor and Theory X and Y? That is systems thinking and this is how...." Or "Remember the self - fulfilling prophecy?" Or the ideas of "common and special causes in some quality programs have their roots in systems thinking." Or "computer engineers apply the theory all the time in designing complex computer systems and this is how..." . Many engineers, who were trained in the technical application of system dynamics now find themselves managing social systems. They have not translated that learning to their new roles. The transition is easy, but experts must make that link for them. Grounding new knowledge in ideas from the past can help people understand this is not a new "buzz" word but rather a way of thinking that has been evolving for decades.

Lesson 4 - Make the learning experience both cognitive and emotional.

Cognitive thinking and decision making are easy for business. Materials, articles, and examples abound that develop

systems theory and provide examples for cognitive learning. Materials that engage the emotions are not as available.

In a recent presentation, Morris Massey, citing the research of Ned Hermann, drew this graphic to emphasize the lack of intuitive and emotional thinking in American business (Positive Employee Practices Institute, October,1989):

fantasy	facts
feeling	form

In explaining the diagram, he noted the comfort business people have in dealing with facts and form (left brain functions) to the exclusion of fantasy and feelings (right brain functions). At work feelings are more often expressed in a negative rather than a positive context (anger in a crisis). Emotions are at a peak. This negative pattern has caused people to be uncomfortable with the use of emotions in training. So rather than tap this powerful learning approach, trainers and system experts alike avoid emotion altogether and lose great impact in learning experiences.

There are many ways to appeal to fantasy and feelings in training. Some of the most effective are the simplest. For example, the willingness on the part of the trainer to share personal stories, whether humorous or sad, that illustrate how system theory plays out in life.

One such story, concerns a Jack Russell terrier who understands the concept of leverage. Cricket, a hunting dog, is a challenge to her owners. She is obstinate, egocentric, intelligent, but will learn only what she chooses to learn. At 18 months she is the master of her household as well as a master at the concept of leverage. She can make her 13 pounds behave like much more when she attacks by rearing back on her hind legs and pouncing with full force. When playing "tug of war" she goes for the hand of the person holding the rope - not the rope. The only way to catch her is to be 'counterintuitive' and to run away from her, not toward her.

Most participants remember longer their experiential learnings. The joke, cartoon or movie that really drove home the point and made us feel as well as think. Participative exercises, cartoons, games, videos, closed eye exercises, movies, books, articles and news clippings are all effective in bringing the emotional component into training. While a detailed listing is attached, several need to be considered in some detail.

The movie, Stand and Deliver (Warner Home Video 1988), portrays an actual system with a leader who uses the dynamics of the system to create the future. The movie generates discussion on individual power in the face of significant odds and is a living example of working with the dynamics of a

system. The protagonist, Jaime Escalante, is still in the system and is known by most audiences as the most effective teacher in America.

A book, Hope for the Flowers (Paulus,1972), is another way to emphasize feeling and fantasy in training. Disguised as a children's book, it is about organizational transformation and systems searching for different ways to approach problems and solutions. Many have commented on the impact this book has had on their thinking.

Having participants close their eyes and imagine various scenes is another way to appeal to feeling and fantasy. One that is helpful in introducing the subject of systems, asks people to imagine three scenes. The first scene is that of a parent rushing to leave work to attend a school program in which a child is performing. Several crises at work and a subsequent traffic jam make this impossible. The next scene is that of a police officer sent in a helicopter to analyze the traffic flow to determine the cause of the traffic jam. The third scene is of the person on a mountain top observing the traffic jam, the helicopter, the city and the surrounding countryside.

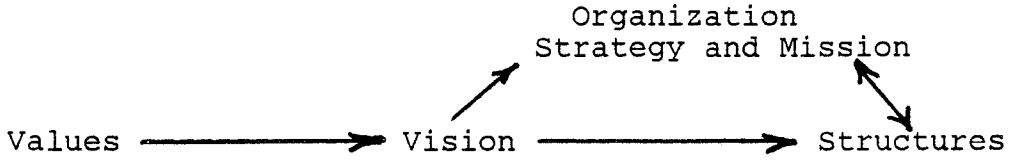
Having people get in touch with their thoughts and feelings in each of the three scenes allows the comparison to the fire fighting people experience day to day and the greater perspective they can experience when "on the mountaintop versus in the traffic jam". It is a short step from this analogy to the ways a leader can see business systems from a greater perspective thru the use of system dynamics and systems thinking.

Lesson 5 - Show the overall context - "The Big Picture".

Adult learners must be aware of the way any training program or consulting project fits with their personal objectives. To be effective, learning must answer a question - "What's in it for me - either now or in the future?" This question needs to be answered on two levels - for the person and for the organization. Experts must be able to show how learning and applying system dynamics will further the objectives of the person as well as those of the business.

While there are many ways of answering this question effectively, they all lead to the mental model of the trainer - the trainer's big picture.

The following model (Dolny, 1990) attempts to make this direct link between the individual and the system or training/project in process. Hopefully, it demonstrates that change in systems is a process that begins with the individual and extends to the larger system.



This model is read left to right and begins with the values of people, their set of beliefs of what is good, right and normal about the ways they chose to live their lives. These values lead them to visions, the deepest desires they wish to achieve both personally and professionally. Both values and visions are deeply personal and often difficult to grasp but they are at the root of our behaviors.

In the larger social system these values and visions are translated into missions, strategies and goals. The individual, must then assess the congruency between personal values and visions, and the business strategy and mission. If their personal values and visions are congruent with the organization's mission then who they are, as reflected by their values, and what they want to achieve, as reflected by their visions, can be realized.

The current challenge for leaders is to put structures in place in the organization that support the mission and strategy and, hopefully, the visions of people.

The world would be a wonderful place if this nice linear model were real life. Rather, structures are in place before people are even in touch with values or visions and seldom does anyone challenge their personal or organizational structures with the questions, "Do these reflect who we really are as people? Will they allow us to realize our deepest dreams?".

The issue for business is that to make lasting change - to commit to any new strategy in the face of tough business pressures and decisions, people must see and understand the ties between values, visions and the structures required to translate these dreams into action. For employees to support and assist the organization in achieving change, they must get in touch with and understand these connections. Otherwise, all will abandon the change and return to the familiar. The change will become another a passing idea that the organization had to tolerate for a period of time.

The role of system dynamics in this model is both in developing strategy and in understanding existing structures and testing new ones. People without an appreciation for system dynamics will implement new structures or make changes in structure without examining the effects of the change on business strategy. For example, there are businesses now implementing a very popular new structure, self directed work teams, without asking if this program supports their strategy. Few are asking the very personal question - does it support my personal values and vision? And those who are asking, seldom allow the whole system to ask and answer the same question. Without the commitment and support that comes with this kind of process, changes will be very short lived.

The questions to help leaders deal with all the stages of the model are:

1. What are my personal values about life? About work?

2. What is my vision for my life? For my work?

3. What picture will best describe my vision?

4. What is the business strategy?

5. How does the strategy support the mission of the business?

6. Is my vision congruent with the organization's mission and strategy?

7. What structures are needed to meet my vision? To meet the organization's strategy?

8. What are the current structures?

9. Where and how do we change the structures?

System dynamics demands that people in organizations focus on THE BIG PICTURE - whether for the business or for consulting projects or training efforts. Adult learners also demand that they know and agree with the steps being taken to achieve a new future. Sharing a model and tying the model to systems thinking and system dynamics, anchors the ideas and helps the organization visualize where they are going and more importantly why they must do certain things to get there.

One of our current business leaders made this point in a recent speech:

"... the concept of liberation, of making work a spiritually enriching rather than a draining experience ... has always been part of the essence of leadership.

"The leader's unending responsibility must be to remove every detour, every barrier to ensure that vision is first clear, and then real. [People] have to feel the rewards that go with winning - in the soul as well as in the wallet.

"How do we get big companies back to their roots - back to the type of spirit and fire that creates miracles in those garage start-ups in Silicon Valley before they get big and before they forget what made them big? That's what we're talking about. Nothing less." (Welch,1990)

To summarize, three compelling reasons - the debilitating sense of powerlessness, the whole system being asked to solve the whole system, and the lack of a bridge between the technical experts and the laymen - are requiring all of us to rethink how we teach and communicate system dynamics.

The future abilities of business organizations to cope with and implement change may be at stake if we fail to meet this challenge.

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Attachment: Materials Effective for Communicating System Dynamics

Videos:

Stand and Deliver, Warner Home Video,1988."Edward Olmos gives a fierce, widely-acclaimed performance as Jaime Escalante, a math teacher at East Los Angeles' Garfield High who refuses to write off his inner-city students as losers. Escalante cajoles, pushes, wheedles, needles, threatens and inspires 18 kids who were struggling with fractions and long division to become math whizzes. The film's exhilarating ending is even more astonishing because it's true."

Joshua in a Box, Bosustow Productions. "Joshua, a strange little creature with human properties, is puzzled to discover he is trapped in a box. Frustrated, he begins to push, kick and pound the box in a vain attempt to break out. After one futile attempt, he manages to squeeze himself out the tiny opening. Elated, he turns around and gives the box a raspberry. After a brief period of exultation over his freedom, Joshua has some second thoughts. His emotions quickly change and a tear runs down his cheek. He opens his mouth very wide as if to shout until he turns himself into a box with him inside once again.

Waters of Ayole, Sandra Nichols Productions. This is the story of a water project in Africa. After years of failing to provide potable water to villages, the engineers involved decide to analyze the project from a different perspective. The many of the characteristics of systems are played out in the video. Participants can observe and easily identify these in a successful story.

The Leadership Alliance, Excellence in Training Corporation. "This program feature Tom Peters before a live audience and on location with four outstanding leaders." One of the leaders, Ralph Stayer, Johnsonville Sausage Company, demonstrates how leaders change structure to fulfill values and visions at work.

"MIT Study of the Business Cycle". MacNeil/Lehrer Report, 10/23/89. This video showing people playing the production distribution game and relates the game to the real cycles of the business world.

Games:

The Production Distribution Game,(Jarmain,W., Problem in Industrial Dynamics, Cambridge:MIT Press,1963; and Sterman,J., Instructions for Running the Beer Distribution Game, Systems Dynamics Working Paper D-3679. Cambridge:Sloan School) This game involves participants quickly in a simulation that demonstrates the impact of structure on system behavior. When combined with the video listed above, managers quickly make comparisons to their own businesses.

A three dimensional puzzle (Steve Tableman, Union Carbide). This is a puzzle of a frog in a simulated pot of boiling water for a team to assemble. Each person on a team takes only 1 piece of the puzzle It is a quick competitive exercise to energize a group. It's purpose is to cement the idea that systems make boiled frogs of all in the system.

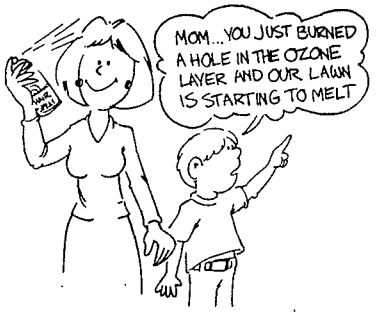
A juggling exercise using 4 tennis balls. A circle (the more people, the better) of people establishes a throwing pattern that must be repeated. The first time they use 1 tennis ball, the second time 2, and the third time, 4 tennis balls are used. The goal now becomes to improve productivity by reducing the time required to juggle the four balls. The key lesson is that until the structure is changed a break thru in not achieved. Other lessons emerge - how quickly goals erode once a pattern is established and how the system appears out of control but is not. (Ron Dukenski, Consultant, Newtown, CT,(203) 270-0777)

The Flying Starship Factory (Block, Petrella and Weisbord,Inc. Plainfield,NJ) is another example of an interactive game that demonstrates the impact of structure on behavior. People participating in the game make a product and attempt to have the customer accept as many as possible. Calculations at the end of the first run prove how expensive traditional structures

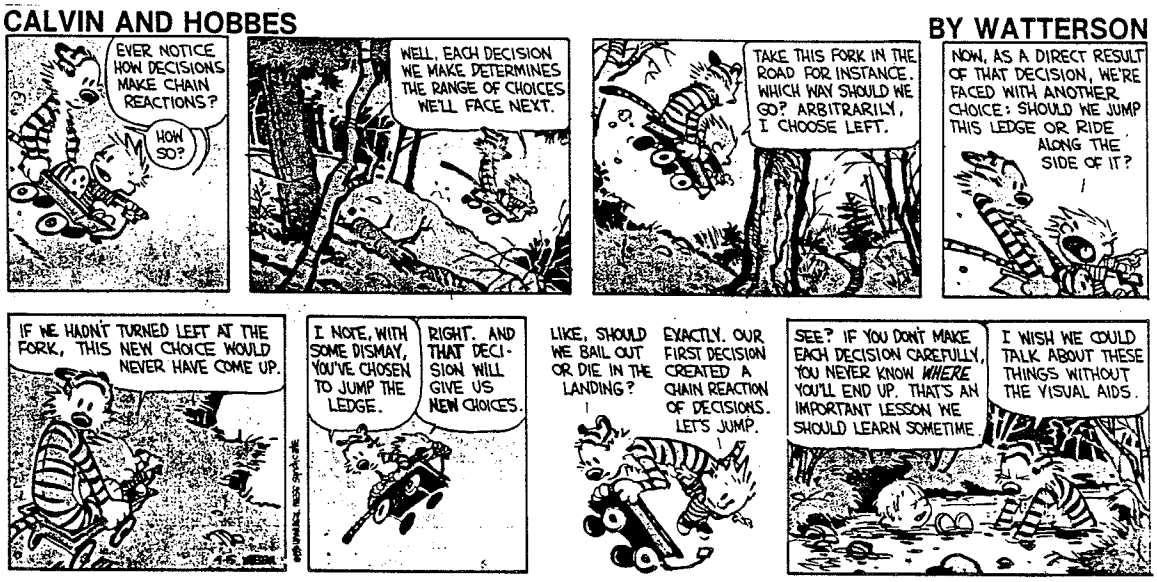
can be. After the system redesigns the structures based on the values of the participants, the second run is much more profitable. This game can be used at all levels and is especially helpful for clients who are asking,"How do we go about changing structures?"

Cartoons:

Marshal Clark, cartoonist (Norwood, Ohio, (513) 731-1860), draws cartoons that illustrate concepts. Several of his include:



Bill Watterson, Calvin and Hobbes cartoonist, often draws comic strips that illustrate system dynamics. Two that have been helpful are:



Books and articles:
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