# Proposal on Projected Workforce Shortage
# Examining Colorado Springs Strategy using Systems Thinking

## Proposal Contents

This proposal contains the following sections:

- **Proposal Summary:** A summary statement of the project approach, goals and problem to be addressed.
- **Systems Thinking Overview:** An explanation of the systems thinking perspective and why it is appropriate for this project.
- **Project Tasks and Deliverables:** A preliminary list of project tasks, deliverables and projected duration.
- **Systems Thinking Methodology:** An overview of the systems thinking methodology in the context of this project, including a preliminary list of influences to be considered in the model.
- **Preliminary Workforce System Diagram:** A preliminary diagram for this project as a starting point for this project.
- **1998-99 Workforce Study:** A summary of a 1998 - 1999 "Workforce Development Coalition System Definition and Leverage Point Identification Committee" study using the systems approach.

## Proposal Summary

**A summary statement of the project approach, goals and problem to be addressed.**

### Project Approach:

Define the considerations — influences and feedbacks — that will determine whether there will be worker surpluses or shortages. Develop a system dynamics map that captures these influences and feedbacks to guide policy development.

### Project Goals:

Develop approaches to guide Colorado regions, focusing on Colorado Springs, in preparing for the future by

- identifying, if possible, a robust strategy to increase the competitiveness and benefit the economy of the Colorado Springs region *whether or not* a worker shortage develops.
- defining a recommended set of policies to deal with potential surpluses or shortages mismatches.
- monitoring whether a worker surplus or shortage is developing.

### Problem Statement:

The U.S. Bureau of Labor Statistics anticipates that more than 25 percent of the working population will have reached retirement age by the year 2010, leaving a potential worker shortage of close to 10 million. Will there be worker surpluses or shortages? If so, what policies can Colorado Springs and other Colorado cities adopt to deal with them?

## Systems Thinking Overview

**An explanation of the systems thinking perspective and why it is appropriate for this project.**

Living beings, organizations, and societies are systems. Systems thinking is seeking to understand system behavior by examining "the whole," instead of by analyzing the parts. To examine "the whole" we examine the "structure" of the system, where structure is the interdependencies and interactions among the parts of the system.

A key principle of system dynamics is that system behavior is determined primarily by its internal structure, not by external influences. While external forces do affect system behavior, we first look for how the system itself is designed to exhibit that behavior.

A "Far Side" cartoon by Gary Larson illustrates this. It shows two horn-helmeted Vikings looking forward from the dragon-headed prow of their armored vessel. Behind them are oarsmen on each side of the deck: big, burly men on the left and slight, skinny guys on the right. One Viking says to the other, "I've got it, too, Omar

… a strange feeling that we're just going in circles." These Vikings may have a well-defined mission, but they must turn around to look at the structure of the system to understand the behavior they're experiencing.

Another example is that a bell rings because it's designed to ring, not simply because it's struck. Most tables don't "ring like a bell" when we strike them; they go "thunk." They don't ring because *their structure isn't designed to ring*.

The same is true for organizations and societies. We must understand the structure of a system to understand its response to external influences; and then we must design and modify structure and policies to get the desired results. When things go badly in our organizations and society, it's because the system was not properly designed to produce the desired behaviors when "hit." A system is a "bell waiting to be struck."

So it's not that external influences do not affect system behavior; it's that first we look for how the system itself may be creating, *or will create when "hit,"* behavior.

We need the systems thinking perspective and the tools & methods of system dynamics to deal with dynamic complexity, just as we require computers, databases, and software to deal with detail complexity. Whereas detail complexity is keeping track of and making sense of lots of data, dynamic complexity is making sense of behavior in systems with multiple feedbacks with long delays.[1]

When feedback is delayed or missing, even a routine task such as driving a car becomes difficult due to slowed reaction time, which is why driving while intoxicated is illegal. Organizations and societies must deal with similar delays and missing or defective feedback. By the time we realize something is wrong, decide what to do about it, do it, and then wait to see the results, months or even years can pass.

So in our society, when we encounter delayed or even missing feedback, we have the same problem as an intoxicated driver. While drunk driving is illegal, there's no law against organizations and societies engaging in equivalent behavior. But there should be, because the cost is high.

In fact, if the relevant feedback is missing, flawed, or not available in a timely manner, organizations and societies fail to learn at all … or even learn the wrong thing, engaging in what system dynamicists at M.I.T. call "superstitious learning."[2]

While we refer to modeling (or mapping) the system, we don't simply model the "system" because everything is connected to everything else. We use the problem statement as a "logical knife" to determine what is, and what is not, to be included in the structure. The goal is to design a structure that will, based on its internal structure, determine the behavior of the system.

## Project Tasks and Deliverables

**A preliminary summary of the tasks to be completed during the project and project deliverables.**

- **Task:** Review, and if needed, revise the problem statement.
- **Task:** Define a preliminary set of considerations to be included in the dynamic hypothesis and to be taken into account in developing the system structure (to be depicted by stock & flow or causal loop maps).
- **Task:** Develop an initial stock & flow map of the system defined by the problem statement. Complete a preliminary map review and revision based on input from individuals familiar with the problem and aspects of the workforce system. Consult these individuals on scenarios & strategies that might be considered.[3]
  - **Deliverable:** Problem statement, initial stock & flow map, and suggested set of scenarios/strategies to be considered in Group Workshop I.

### On Scenarios

Different scenarios are different combinations of uncertainties.

Different assumptions about sets of uncertainties will produce different scenarios. Examples are, all else being equal:

- Less restrictive Federal Reserve monetary policy will increase economic growth and vice-versa.
- Faster economic growth will increase the number of jobs to be filled and vice-versa.
- Policies that favor offshore outsourcing will decrease the number of jobs to be filled.
- Policies that promote productivity improvements will decrease the number of jobs to be filled.
- An aging workforce will reduce the supply of workers, if incentives to remain are insufficient or new workers are not brought online quickly.

---

1 Though feedback and delays are everywhere, we're generally as unaware of them as we are of the air we breathe.

2 See, for example, in Nelson Repenning and John Sterman, "Nobody Ever Gets Credit for Fixing Problems that Never Happened: Creating and Sustaining Process Improvement" (2001) at http://web.mit.edu/nelsonr/www/CMR_Getting_Quality_v1.0.html.

3 Tasks with group and individuals will be accomplished drawing as much as possible from those who participated in the 1998-1999 workforce study and with other individuals familiar with aspects of the workforce system.

- **Task:** In Group Workshop I with a group familiar with the problem and aspects of the workforce system.
  - Review the map and revise as needed.
  - Define & select scenarios to be considered and potential strategies to deal with them.
- **Task:** Based on input from Group Workshop I, revise the problem statement, stock & flow diagram map, and the set of scenarios/strategies to be considered.

  For overall flow of the systems scenario/strategy process, see the diagram below.

  - **Deliverable:** A report on the results of Group Workshop I.
- **Task:** In Group Workshop II
  - Assess group consensus on the expected outcomes of "mental simulations" of the structure for each of the top selected strategy-scenario combinations (nominally 3 scenarios and 3 strategies).
  - Rank strategies.
  - Identify, if possible, potential robust strategies (see box).
  - For the most robust strategies identify scenarios for which the expected outcome is unfavorable. Identify early warning indicators that can be monitored to see if an unfavorable outcome scenario is developing.
  - Recommend and rank actions to promote favorable conditions for the top-ranked scenarios.[4]
  - **Deliverable:** A report on the results of Group Workshop II task results.
- **Project Duration:** Approximately 3 months from start of work.

**On Strategies**

Different strategies are different combinations of options.

Different assumptions about sets of options will form different strategies. Examples are:

- Investments in education will increase the number of qualified workers & vice-versa.
- Greater employer willingness and ability to hire, accommodate and train older workers will increase the number of qualified workers & vice-versa.
- Greater investment in productivity improvements will decrease the number of jobs to be filled.
- The more employers value the experience and maturity older workers, the greater the supply of workers.

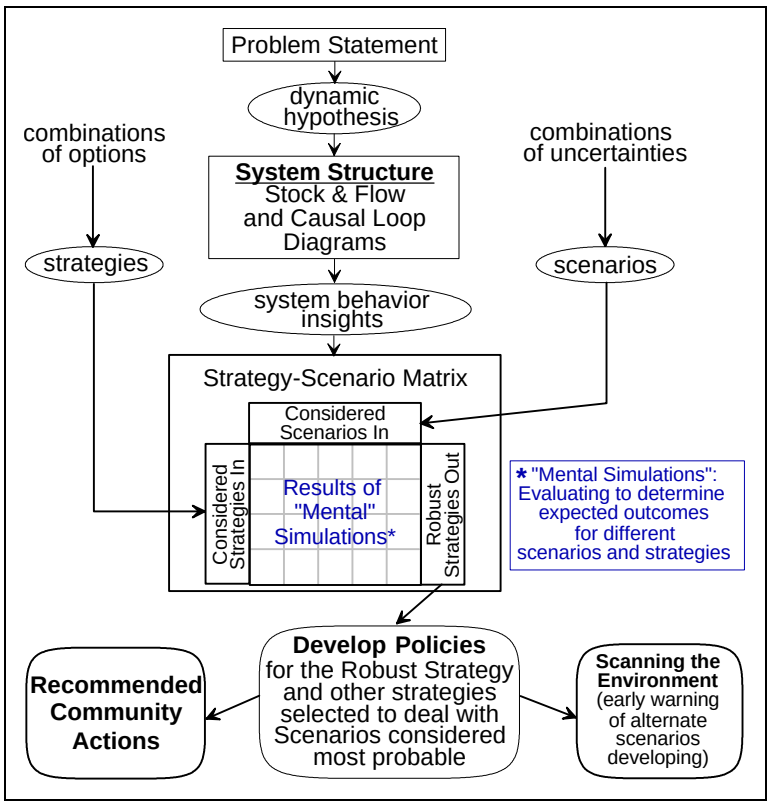
**Robust Strategy**

- A strategy that has favorable outcomes for most or all scenarios considered.

## Dynamic Hypothesis

A dynamic hypothesis is a preliminary description of the structure and feedbacks in the system and how system behavior will depend on the feedbacks (see **Preliminary Workforce System Diagram**). Preliminary list:

- Workforce stocks: Unemployed Potential Workforce, Qualified Workforce, Employed Workforce, Unemployed Not Re-engaged, Workforce In Training. Very likely will need to take into account some age cohorts
- Job stocks: Jobs Open, Jobs Filled
- Rapidity and extent of productivity improvements, offshore outsourcing, corporate consolidations
- Economic growth due to consumption and investment multipliers; assumptions about where the economy is in the long wave
- Economic growth due to impacts of trade and federal deficits, as well as foreign country & Federal Reserve policy in response to these deficits




[4] An option will be to use the "causal loops to action" approach explained in "Look for the Loops," Bob Powell (640K)
Link: http://www.exponentialimprovement.com/cms/uploads/HBR_Loops01as.PDF

- Tax policies, such as the Social Security earnings test that reduces work incentives for older workers
- Assumptions about "slack" in workforce engagement from involuntary part-time, underemployed, self-employed, and discouraged
- Assumptions about employers willingness and ability to adapt to an increasing proportion of women in the workforce
- Assumptions about employer willingness and ability to adapt to an increasing proportion of minorities in the workforce
- Assumptions about employer willingness and ability to bring younger workers into the workforce.
- Government spending on education
- Assumptions about employer willingness and ability to hire, accommodate and train older workers, as well as on how they value their experience and maturity
- Colorado Springs emphasis on maintaining quality of life to attract workers.

## Key Variables

Key variables will be drawn from previous work on workforce-related problems and articles on the problem.

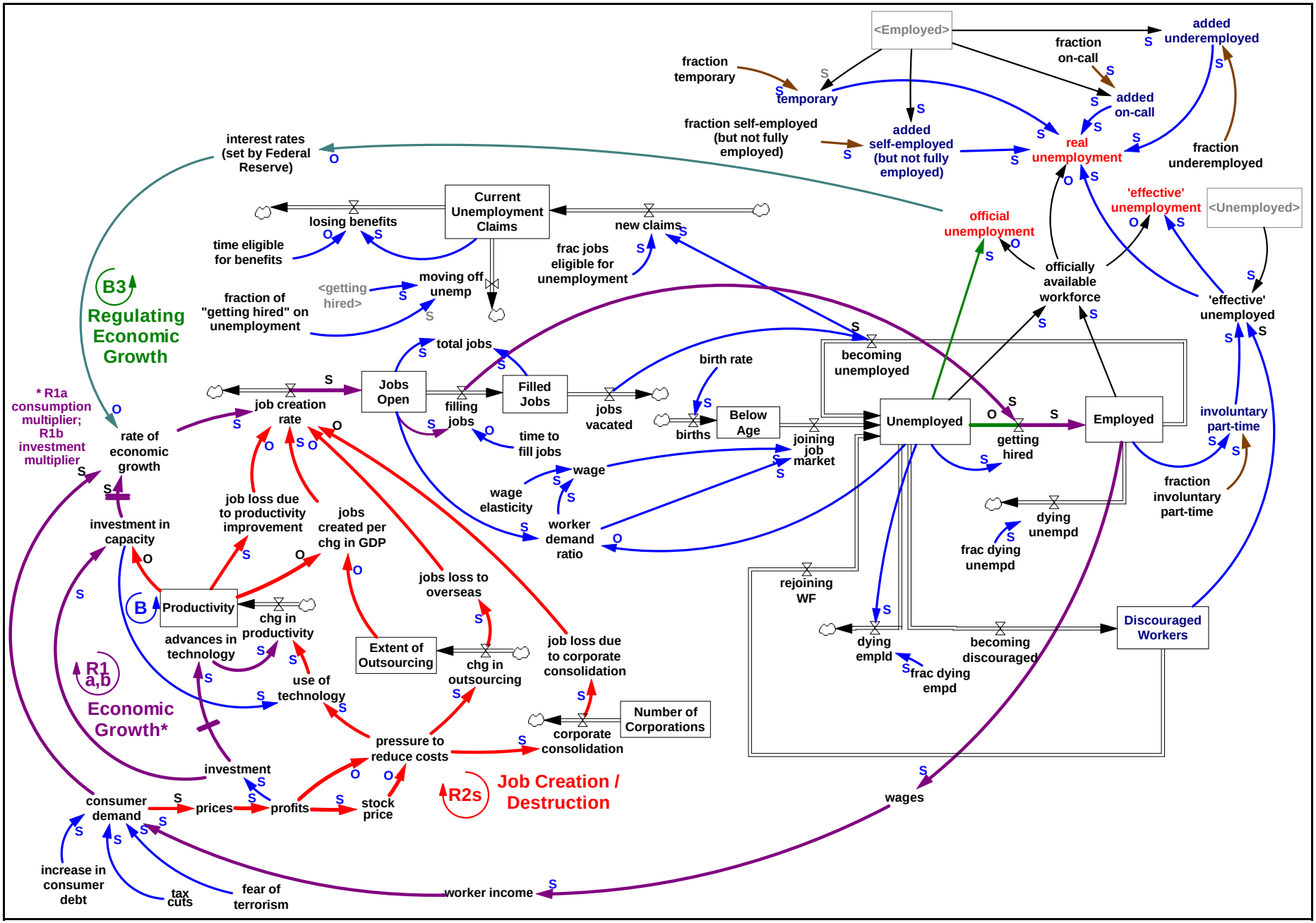
Potential variables (preliminary list):

- Unemployed
- Employed categories
  - fraction part-time
  - fraction temporary
  - fraction self-employed
- Discouraged Workers
- Current Unemployment Claims
- Productivity
- Extent of Outsourcing
- Number of Corporations (relative to consolidation for job elimination)
- Job categories
  - Open Jobs
  - Filled Jobs
- Wage
- Funds for Training
- Worker Skill Level
- elasticity of part-time hours available
- reentering workforce elasticity of discouraged workers
- underemployment factor
- wage elasticity
- fraction underemployed
- investment in technology
- outsourcing of jobs overseas
- corporate consolidation
- consumer demand
- rate of economic growth
- jobs created per change in GDP
- effect of Social Security earnings test
- expectations about older worker productivity
- expectations about older worker know-how
- birth rate
- fraction discouraged rejoining WF

## Preliminary Workforce System Diagram

See next page.

# Preliminary Stock and Flow diagram of Workforce Structure




Bob Powell, Ph.D., MBA ▪ Continuous Improvement Associates ▪ 6992 Blackhawk Place ▪ Colorado Springs, CO 80919
Ph. 719 599-0977 ▪ E-mail: scuba@usa.net ▪ Website: www.exponentialimprovement.com ▪ 

# Workforce Development Coalition System Definition and Leverage Point Identification Committee Activity Summary 1998-1999

## Contents



## Workforce Coalition Leadership, Membership, Vision, & Mission Overview

### Leadership

The initial leadership that chartered the Workforce Development Coalition:

- Rocky Scott, President, Greater Colorado Springs Economic Development Corporation
- Mark McCord, President & CEO, Colorado Springs Chamber of Commerce
- Dr. Marijane Paulsen, President, Pikes Peak Community College

### The Workforce Development Coalition Vision

- The greater Pikes Peak region will be a community in which all stakeholders (individuals, education and training institutions, businesses, non-profit agencies, and government entities) recognize and embrace the pivotal role of workforce development in achieving personal fulfillment and regional economic prosperity.
- To put in place long term programs and systems to coordinate and integrate the many initiatives and institutions involved in developing our workforce to meet the current and future workforce needs in all sectors of the region's economy.

### Workforce Development Coalition Subcommittees

- Vision Development
- System Definition
- Membership Identification and Recruiting
- Measurement, Accountability, and Reporting
- Coordination, Communication, and Public Awareness

### The System Definition Committee

#### Committee Leadership:

- Chair: Nina Polok - Hewlett Packard
- Vice-Chair: Debbie Sagen - Corporate Workforce & Economic Development
- System Process Facilitator: Bob Powell - Continuous Improvement Associates

#### Members:

- Ken DeGrasse - Harrison School District #2
- Dee Funkhouser - Pikes Peak School-To-Career Partnership
- Roger Hamilton
- Charlie Huff, Dave Bamberger & Associates
- Karen Jasmund - Pikes Peak Workforce Center
- Beth Ann Lipskin - Pierpont Associates & Pikes Peak School-To-Career Partnership
- Jan Martin, Martin Business Group
- Elaine Naleski - School District 11

## System Definition Committee Vision, Mission and Focus

The System Definition Committee's initial meeting was held on July 17, 1998. In the first few meetings the group developed a Vision and Mission.

### Vision:

- We understand the system of workforce development in the community and how it impacts the individual throughout his or her life.
- We develop the ability to identify key changes to the system that will improve the probability of long-term individual, employer, and community success.

### Mission (main points):

- Develop a system diagram that reflects current workforce development initiatives which affect the ability of an individual to learn and be an effective and agile lifelong worker.
- Identify and develop recommendations to exploit leverage points in the current workforce development system which offer the greatest opportunities for learning & development … .
- Identify and develop recommendations for changes to the existing system for workforce development.

### Focus:

Also, in the first few meetings the group decided on taking a systems thinking approach to defining the system. The model used the following as a focusing statement.

Workforce Model Focusing Statement - Success means individuals having good jobs, employers having good workers, the community having a sustainable economy and a workforce system that is adaptable to changing workforce supply and demand.

This statement makes the point that when the economy is good, we need to develop workers to fill the open jobs, and when the economy turns down, we need to attract or grow companies to employ workers without jobs.

## Model Review Workshop

We developed an initial model and held a model review workshop on 1/27/99 at the Antler's with representatives of business, education and government to get input from people who had not been on the team.

### Selected comments from the 1/27/99 Model Review Workshop

What went well …

- The structure is necessary and although complex, produced useable information.
- Systems thinking is an awesome tool.
- Relationship building opportunities.
- The quick lesson on systems definitions.
- Open dialogue, active participation.
- All sessions seemed to go well. Well organized.
- Great group of people gathered together.
- I appreciate all the work done prior to this meeting.

What we could improve …

- Less complexity - strive for simplicity.
- Allow more time for interactive dialogue, grounding.
- Small group needed more quiet area to concentrate.
- More context - for those who have little exposure to this kind of thinking/model.

## Work following the Model Review Workshop

Following Model Review Workshop:

- We incorporated 25 of 49 workshop suggestions into the model.
- We restructured the model to clarify and simplify the reinforcing & balancing feedback loops.
- We added additional structure.

## The Systems Thinking Approach

### What it allows:

The systems thinking methodology allows an organization or a community to go

- from a "Mess" of Issues / Problems
- to a Theory of the System
- to Strategies
- to Project Planning: Who's going to do what by when.
- to Project Tracking and Reporting
- for Workforce System Effectiveness Improvement

### Using systems thinking we:

- Identify the self-reinforcing feedback processes for growth.
- Identify the balancing feedback processes which limit, or will limit, growth.
- Identify the balancing feedback processes which resist, or will resist, the changes to be made.
- Define strategies and action plans to implement reinforce growth and reduce limiting forces.

### The Systems Model

In developing the model the team met approximately 41 times for 2 hours each through 8/31/99 including workshops, quarterly meetings, and final review. See following pages.

### Strategy Matrix

Below is an example matrix for defining strategies.

**Strategy Matrix: Functions vs. Key Success Loops & Driving Forces**

| | Key Success Loops & Driving Forces | | | | |
|---|---|---|---|---|---|
| Community Organization or Individual | Loop R1 Develop Local WF | Loop R2 Worker Inmigration | Loop R3 Counseling Effectiveness | Loop XX | Summary of Strategy for each Function |
| EDC | | | | | |
| Chamber of Commerce | | | | | |
| City Council | | | | | |
| Human Resource Mgrs | | | | | |
| Other | | | | | |
| Summary of Strategy for Each Loop or Driving Force | | | | | |

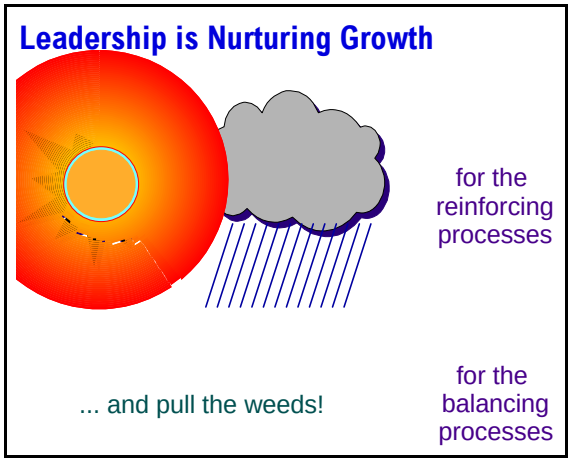
... adapted from
Clayton Christensen, "Making Strategy: Learning by Doing," *Harvard Business Review*, Nov/Dec 1997

### Leadership

This is the approach we'd take in a garden (see below). For reinforcing processes we provide sun, water, and food; and for balancing processes we pull the weeds.

### Leverage

The leverage in the system is in promoting favorable activity in the key feedback loops, the loops around which people have energy. An early activity is to identify community activities supporting the key loops and organize projects/dialogues around key loop structures. Like a bicycle chain, a feedback loop is only active if all links in the chain move.




To do this we …

- Identify weak links in the key loops.
- Identify what promotes beneficial activity at the weak links.
- Identify what's limiting beneficial activity at the weak links.
- develop policies that promote beneficial loop behaviors.

… and take action to

- create new beneficial loops
- break or reduce the influence of limiting loops to improve performance
- increase beneficial loop behavior
- reduce constraints at weak links
- create new communication links to inform on progress
- develop & implement new measures to monitor loop performance
- institute environmental scans for externals that affect loop performance

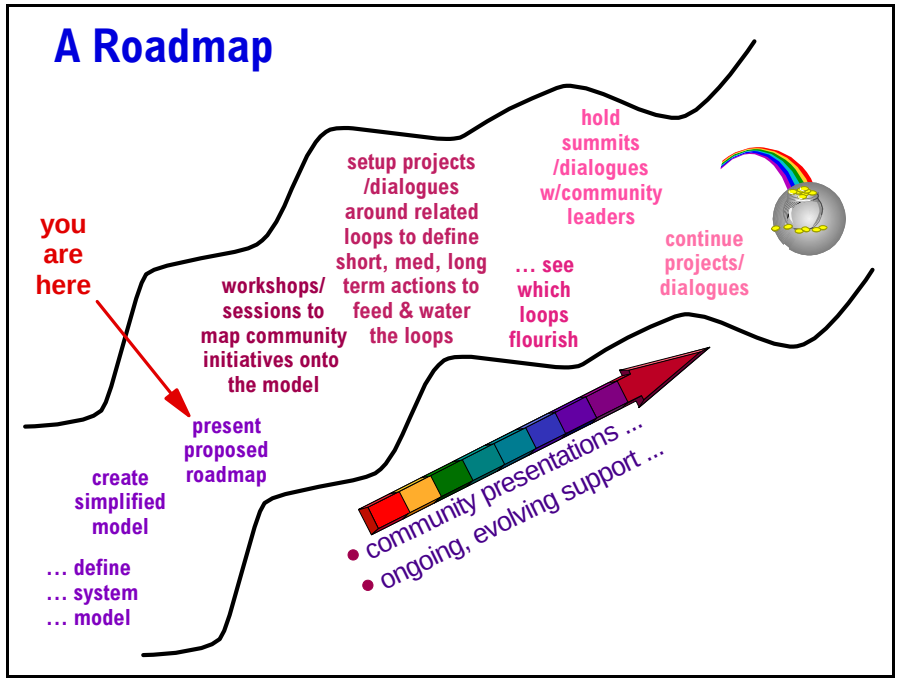
## The Road Map for Future Work

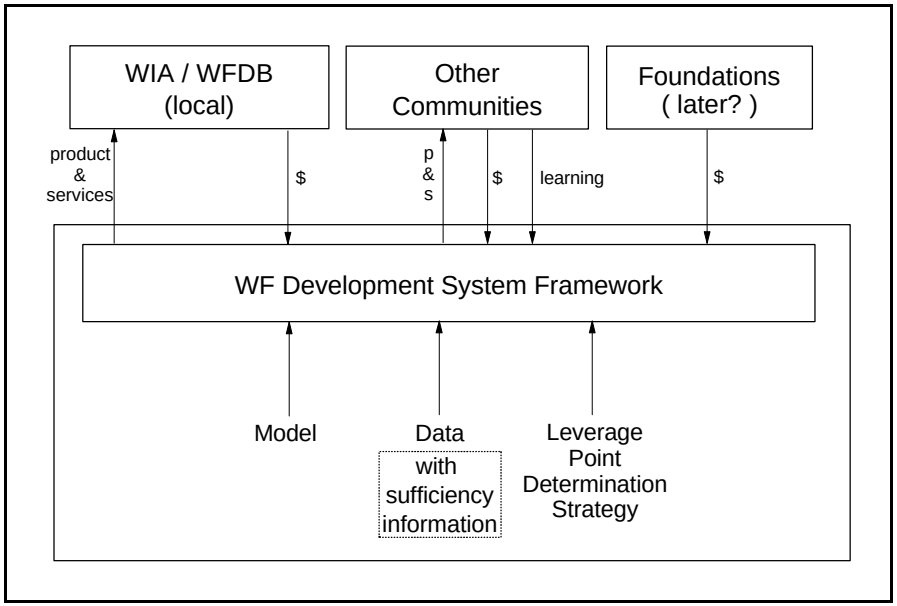
The road map the group presented at the 8/31/99 (see diagram also):

- Define system model.
- Create simplified model.
- Present the proposed road map at the end of the committee's model development work.
- Hold workshops/sessions to map community initiatives onto the model.
- Setup projects/dialogues around related loops to define short, medium, and long term actions to "feed & water" the loops.
- See which loops flourish.
- Hold summit/dialogues with community leaders.
- Continue projects/dialogues.

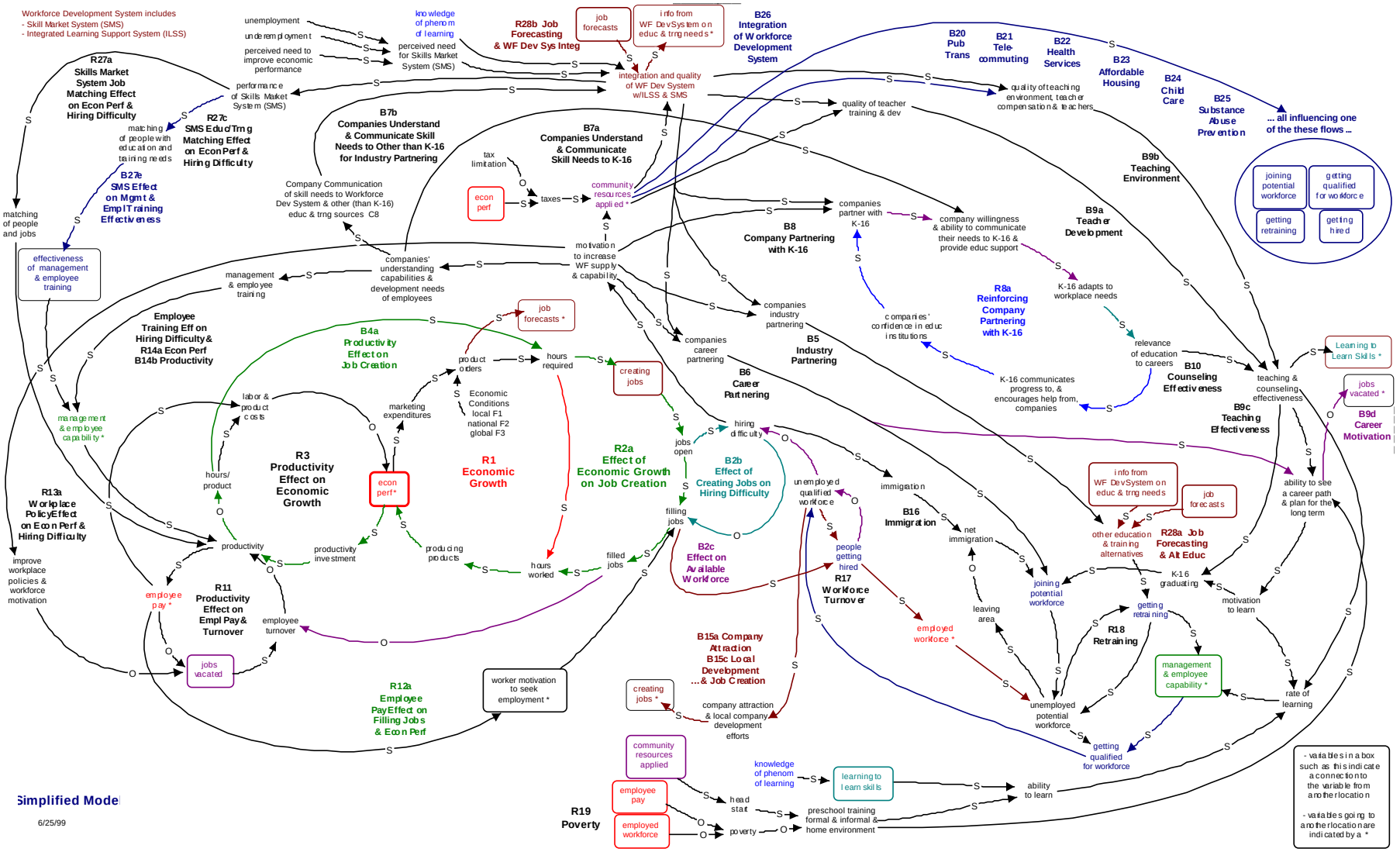
## Following System Definition Group Activity

Rocky Scott proposed the diagram below as a possible way to make the model available to other communities and support continued work. This could provide funding and allow us to learn, not only from our community experience, but also from the experience of other communities.



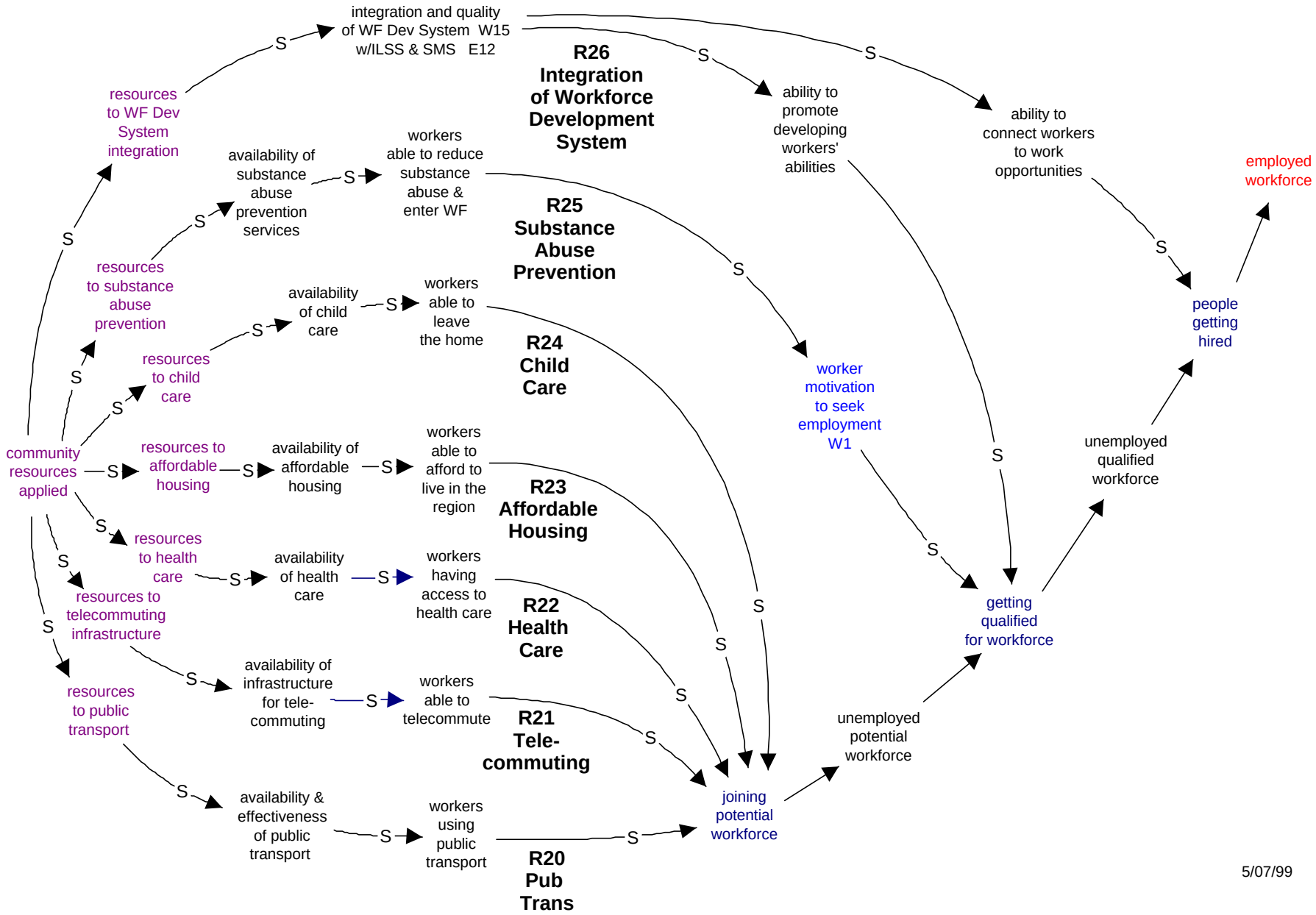



# The Workforce Model Developed by the System Definition Committee




Bob Powell, Ph.D., MBA ▪ Continuous Improvement Associates ▪ 6992 Blackhawk Place ▪ Colorado Springs, CO 80919
Ph. 719 599-0977 ▪ E-mail: scuba@usa.net ▪ Website: www.exponentialimprovement.com ▪ 

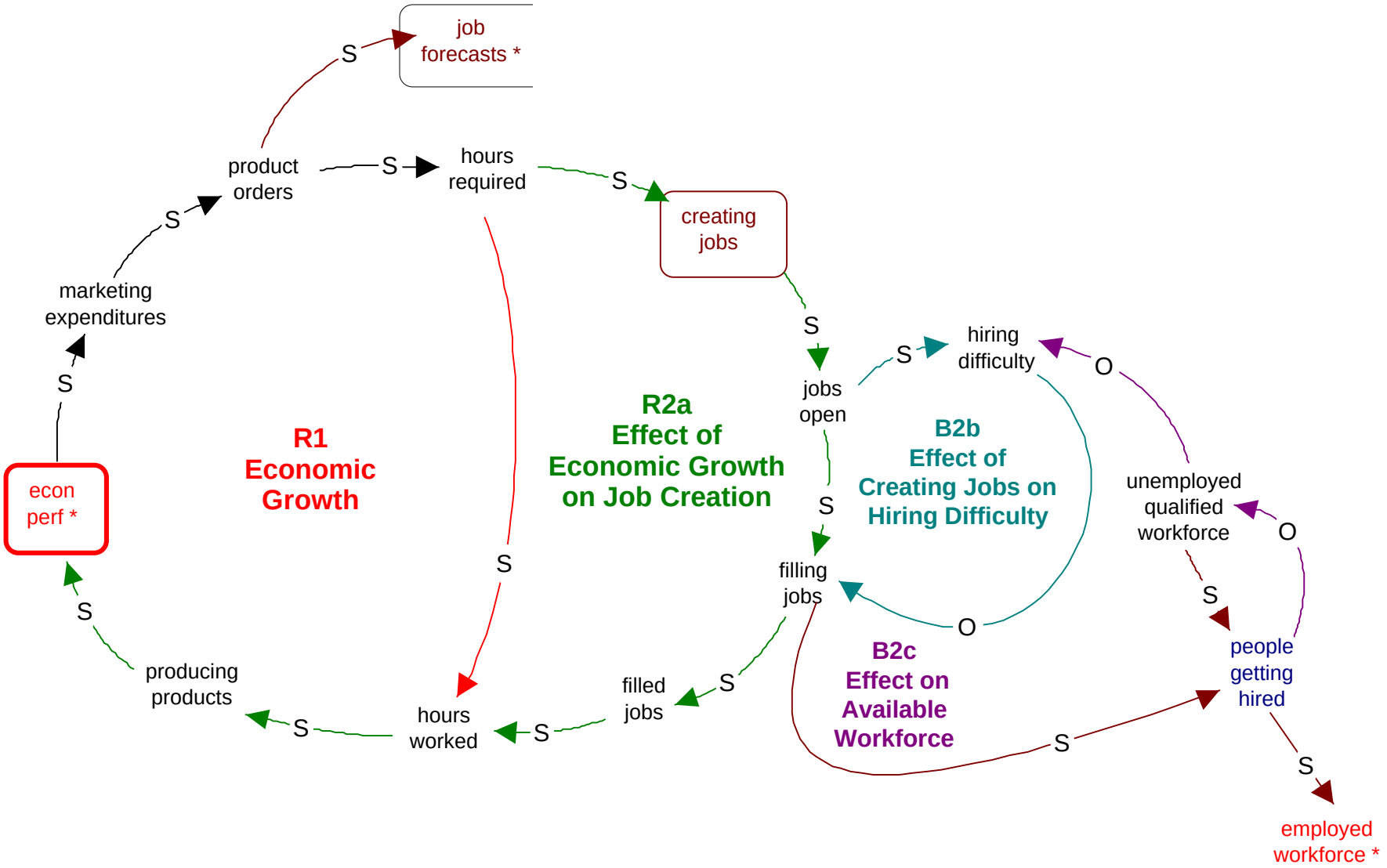
## Workforce Model - Supplemental Loops B20 - B26



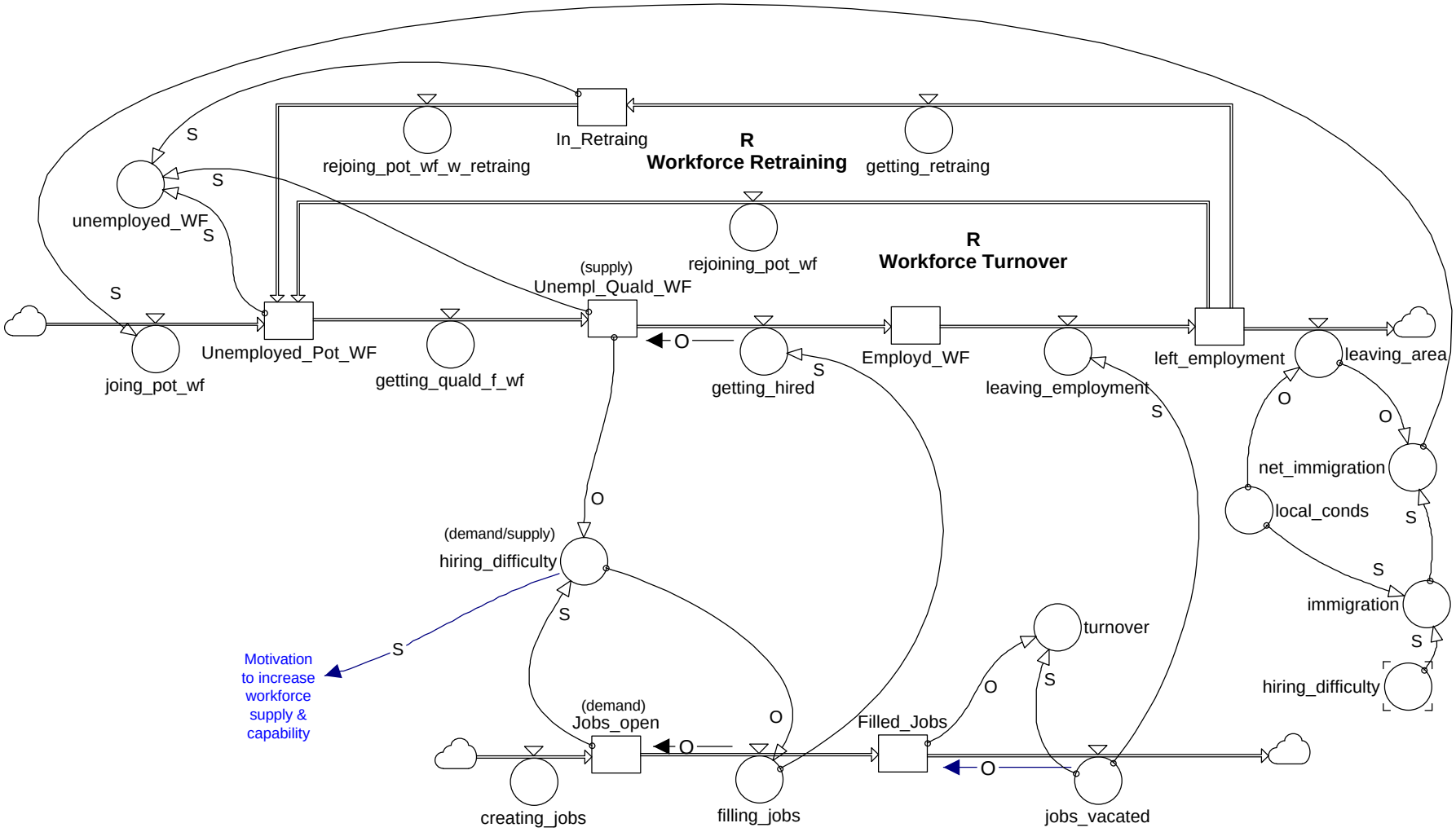

5/07/99

Bob Powell, Ph.D., MBA ▪ Continuous Improvement Associates ▪ 6992 Blackhawk Place ▪ Colorado Springs, CO 80919
Ph. 719 599-0977 ▪ E-mail: scuba@usa.net ▪ Website: www.exponentialimprovement.com ▪ 

## The Workforce System Model Core
## The Economic System: Engine & Bake



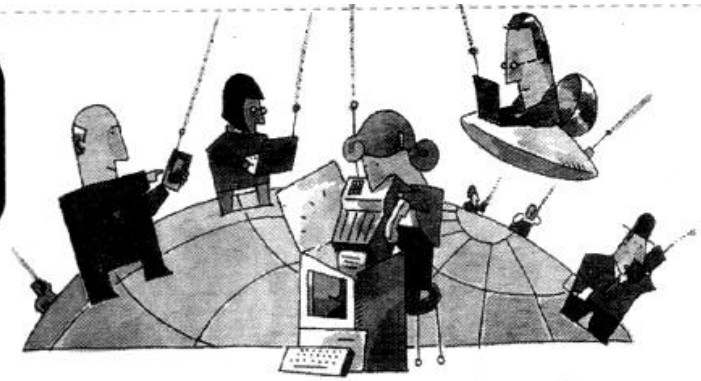
## The Workforce System Model
## Underlying Stock & Flow Structure



**News Article on the Workforce System Definition Committee's Work**

The Gazette,
Colorado Springs
Monday, 10/18/99

# THE LOOP



## Physicist has Springs business leaders going loopy

Bob Powell doesn't see things in straight lines.

And now he has a whole group of Springs movers and shakers going a bit loopy.

Powell, a physics Ph.D. and MBA who runs **Continuous Improvement Associates**, a consulting business, helped lead the **Colorado Springs work force Development Coalition** through a yearlong process of mapping out the state of the Springs' work force, what causes change within it and what could improve it. The resulting causal loop diagram, a multicolor swirl of arrows, is reminiscent of illustrations that show how a hurricane forms.

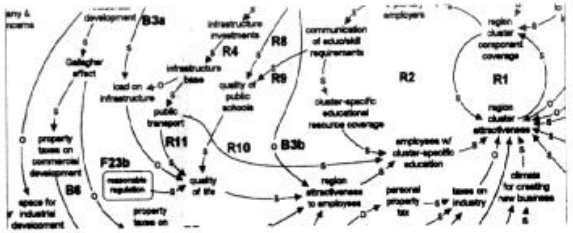
But there's order in what looks like chaos, loop fans say.

"We now have the ability to show people logically how things we knew had an impact fit into the big picture," said Robert Scott, president of the **Greater Colorado Springs Economic Development Corp.** "For example, we might not think of it, but transportation fits into work force issues: The biggest shortage is in the lower skills, and those are the people that need transportation the most. It's a lot easier to explain that when you can show how it fits into the bigger picture."

Companies or organizations that want to use this method to understand a systemic problem must first define their organization's underlying structure.

"The leadership of an organization that does not understand its structure is like a crew flying a plane that cannot handle turbulence," Powell said.

Then the group can start creating causal loops, which show the "ecology" or connectedness of a system, Powell said.




"Everything that grows is based on a reinforcing process," he said. "But nothing grows forever. You have to also understand your balancing processes."

An example of variables on a loop: Companies partner with kindergarten-through-college programs, leading to company willingness and ability to communicate its needs to K-16 and provide educational support, leading to K-16 adapting to workplace needs, leading to relevance of education to careers.

Come again?

It's a nonlinear way of thinking, Powell said.

"Generally we think, 'He did that.' But you have to know that it comes back to affect you."

At a Celebrate Technology Week seminar, Powell, Scott and Pikes Peak Community College President Marijane Paulsen presented the work force loops in a Power Point presentation, going arrow by arrow to explain and create the resulting model. The session was the hit of the morning, as participants saw how schools, social needs, employee training, turnover and productivity, among other things, are all interrelated in the Springs-area's current labor shortage.

"A light went on. They said, 'Gosh, now I can understand that,' " Scott said.

This systems thinking has other applications, as well: Powell has used it at his church to examine ways to foster increased membership and volunteerism.

Scott recently used it to show utilities advisors that in the long run, a system development charge might have the opposite effect they're seeking.

Paulsen said PPCC may use it "to look at the structures we have in place and whether we are getting what we want from them."

Members of the Workforce Development Coalition may eventually take the causal loop process on the road to help other communities, Powell and Scott said.

**— Jane Turnis**