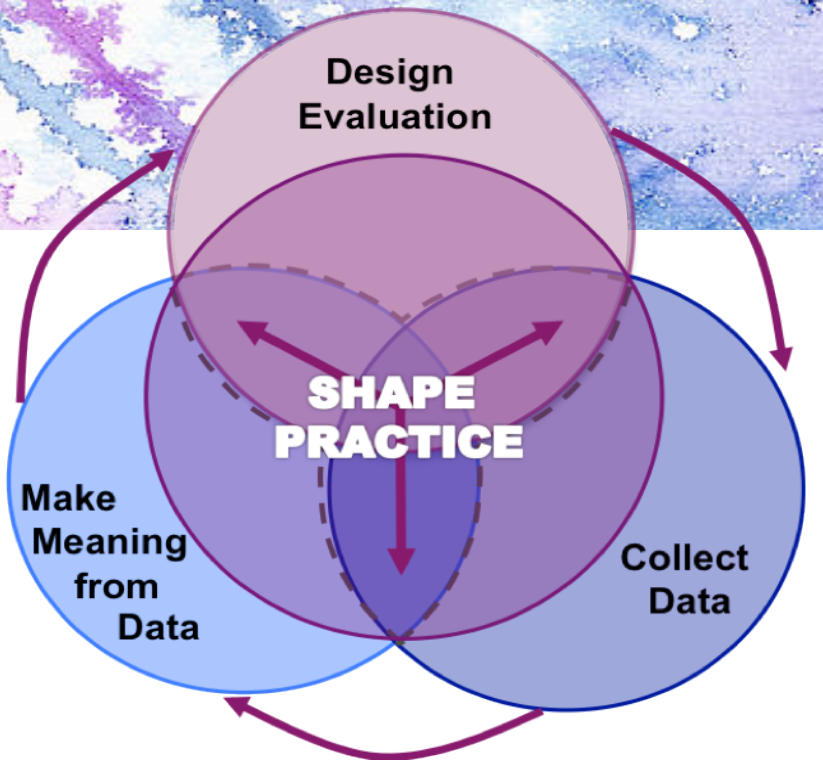
# Using a Systems Orientation in Evaluation




**Beverly Parsons**
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# Using a Systems Orientation in Evaluation

**Systems Definition**

A system is an interconnected set of elements that is coherently organized in a way that achieves something. (from Meadows, D. (2008). *Thinking in systems: A Primer.* White River Junction, VT: Chelsea Green Publishing Company.)

**Types of Systems**

- Hierarchical/Nested
- Networked
- Heterarchical

**Evaluation Purposes when Systems Orientation may be Useful**

- Cause and effect relationships
- Program development
- Sustainability
- Fundamental systems change

Go to www.insites.org for many resources related to using a systems orientation in evaluation. Look under the *Evaluations and Resources* tab

# Habits of a Systems Thinker

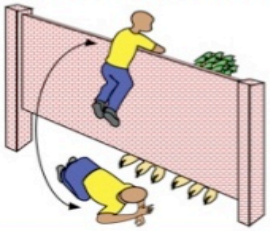
Seeks to understand the big picture

Observes how elements within systems change over time, generating patterns and trends

Recognizes that a system's structure generates its behavior

Identifies the circular nature of complex cause and effect relationships

Changes perspectives to increase understanding



Surfaces and tests assumptions

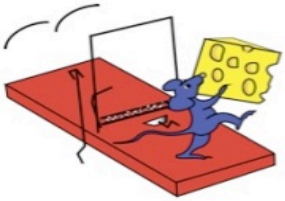

Considers an issue fully and resists the urge to come to a quick conclusion

Considers how mental models affect current reality and the future

Uses understanding of system structure to identify possible leverage actions

Considers both short and long-term consequences of actions


Finds where unintended consequences emerge



Recognizes the impact of time delays when exploring cause and effect relationships

Checks results and changes actions if needed: "successive approximation"

# Using Complexity Science-Informed Concepts When Designing System Interventions and Evaluations

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*The ideas in this document continue to be informed by conversations with many others involved in bringing complexity science-informed ideas into evaluation. Debates continue about the translation of complexity science concepts to human situations.*

*Ideas stimulated by the complexity sciences and their application to evaluation are discussed in more detail in two documents available on the W.K. Kellogg Foundation (WKKF) website. The names of the documents are (a)* An Overview: Designing Initiative Evaluation *and (b)* Designing Initiative Evaluation: A Systems-oriented Framework for Evaluating Social Change Efforts. *Go to http://www.wkkf.org and enter the name of the document in the search box to find them in the list of WKKF publications.*

## *Complex Social Systems*

Complex social systems are composed of massively entangled formal and informal organizations and networks. They may be an interconnected web of hierarchical, bureaucratic organizations, networks of small formal and informal groups, communities, family systems, and more.

Deeper understanding of these complex systems comes through viewing them as having multiple dynamics.[1] An understanding of system dynamics provides ways to observe, live within, and influence social systems. Although it may be an oversimplification, system dynamics can be described as three types—organized, adaptive (self- organizing), and unorganized.

One useful way to think about the relationship of these multiple dynamics within complex social systems builds on the work of Ralph Stacey[2] who proposed the degree of (a) agreement and (b) certainty in a social system as a basis for differentiating system dynamics. "Agreement" refers to the degree of accord among, for example, those in a group, team, organization, or community about their priorities and the activities they

1 Viewing the world in terms of system dynamics is a model of reality, not necessarily reality itself.

2 Stacey, R. (1996). *Strategic management and organisational dynamics*. 2nd edition. London: Pitman Publishing. (This description is not in later editions of this book.)

engage in. "Certainty" refers to how predictably cause-and-effect relationships among actions, conditions, and consequences can be anticipated. (See Figure 1.[3])

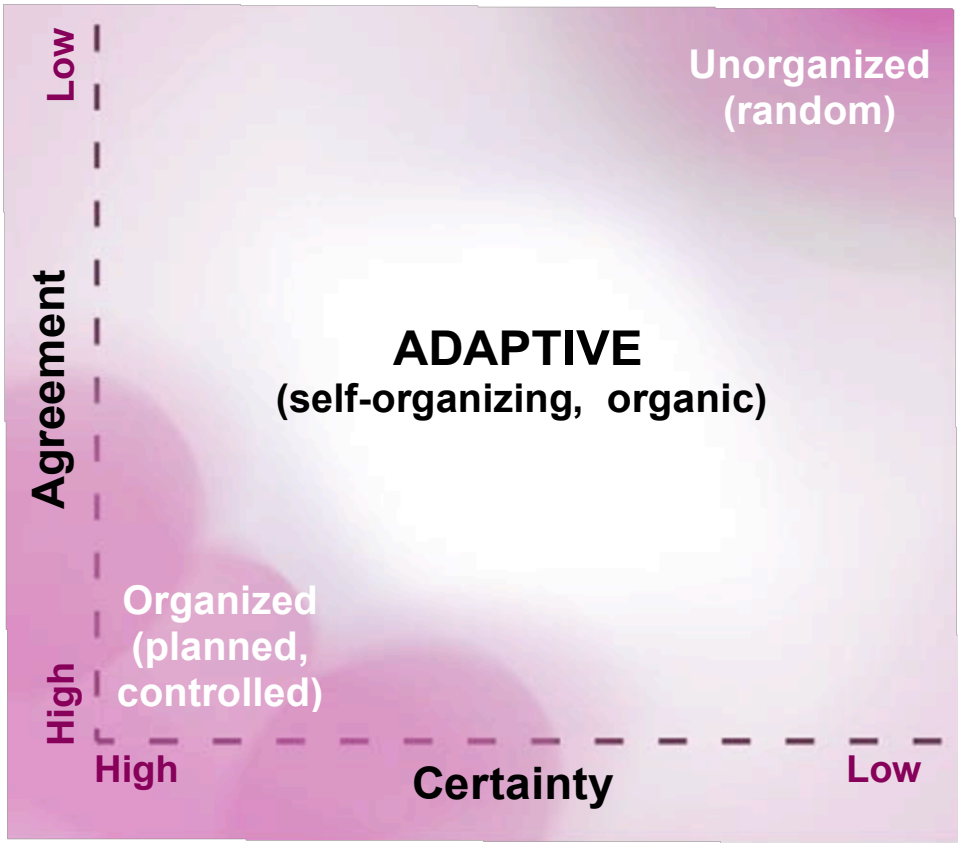


***Figure 1. System Dynamics related to Certainty and Agreement[4]***

## *Organized System Dynamics*

Where the levels of certainty and agreement are high (lower left of the diagram), one finds **organized, predictable system dynamics**. Traditional hierarchical organizations and assembly lines are largely designed on the **assumptions** of this type of system dynamic. They are based on structured roles, planning, and control.

Organizations that emphasize this dynamic are often nested systems such as levels of government, in which the local level is nested within the state level which is within the federal level. This dynamic may be present in a small system as well. For example, training sessions are often designed around this dynamic. Instructional processes are carefully designed to lead to planned student outcomes. The design of the instructional processes is based on research evidence and the learning outcomes are measurable.

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3 This figure is based on the work of the following sources as well as Stacey (referenced earlier); Zimmerman, B., C. Lindberg, & P. Plsek (2001). *Edgeware: Insights from complexity science for healthcare leaders.* Irving, TX: VHA, Inc. and Human Systems Dynamics Institute (www.hsdinstitute.org).

4 Other parameters instead of certainty or agreement could be used as ways to investigate system dynamics.

Research and evaluation methods that assume predictable, usually linear, cause-and-effect relationships are designed with an assumption of organized dynamics.[5]

## *Unorganized System Dynamics*

At the other end of the spectrum shown in the diagram, where systems exhibit both low certainty and low agreement, one finds a **random, unorganized dynamic** such as one might find at the moment of a natural disaster. Systems have essentially disintegrated. Actions are unpredictable and random. Within complex social systems, many events and actions can appear to be random. We cannot see any patterns or connections between them and other events or actions.

Research and evaluation methods that rely on probabilistic statistics assume that what is not predictable by the cause-and-effect model of the method is unorganized and random.

## *Adaptive System Dynamics*

**Between these two ends of the spectrum is a special dynamic.** The system is far from the equilibrium of either an organized state or the disintegration of an unorganized state. **It is a complex adaptive system (CAS) where agents self-organize.** Since it is the way plants and many animals organize, it is sometimes referred to as **organic organizing**. The core idea is this: *In complex adaptive systems, many semi-independent and diverse agents, who are free to act in unpredictable ways, continually interact with each other. They are adapting to each other and the environment as a whole.* They can create influential system-wide patterns. They are not necessarily moving toward stability and tend not to be controllable although they can be influenced.

## *Interconnections of System Dynamics*

In the figure and in our explanation above, we have described the dynamics as if they are separate. However, three points are important to realize:

1. The three types of system dynamics are entangled in social systems. To gain understanding of a complex system, we may selectively look at dynamics. It is as if we had glasses that filter out certain dynamics. When we view the landscape of systems, the glasses do not change the landscape itself but allow us to experience the landscape in a different way.
2. The three types of dynamics can be thought of as different phases and types of energy that can transform from one to another. It is much like water being able to be a solid, liquid, or gas.

5 Some people further separate organized dynamics into "simple" and "complicated."

3. The action around the boundaries of these transitions is important. Considerable movement is occurring and may be especially influential in systems change.

## *Complex Adaptive Systems and Adaptive (Self-Organizing) Dynamics*

A wealth of tools and methods exist for understanding and influencing the planned/organized dynamics. These tools and methods, based on linear and/or simple non-linear predictions of cause and effect, include strategic planning, setting specific outcomes, and using research methods such as randomized controlled trials (RCT). Because the language and concepts of organized systems are well known, we do not address them in this paper. Instead, we want to elaborate on concepts about complex adaptive systems and the nature of adaptive dynamics. This is the place where new vocabulary and concepts can be helpful in understanding complex systems and their dynamics.

The complexity sciences have their beginnings centuries ago, but the ideas started to receive serious attention in the scientific community in about the 1980s. Thus, the understanding and applications of the concepts are still in their early stages of development. The concepts below originate in the physical and biological sciences and have mathematical underpinnings. In the descriptions below, we have tried to strike a balance between retaining the language of these fields and describing the concepts in terms more commonly used in the social sciences.

Although the idea of multiple dynamics within social systems is often quickly understood at an intuitive level, the terms can be difficult to understand at first. Once grasped, however, the concepts provide a powerful set of tools for understanding and influencing organizations and networks. The tools provide the basis for taking action, undertaking research, and evaluating change within these entangled systems.

Theories about complex adaptive systems take the position that there is a powerful and important dynamic in systems—self-organization—that can be understood and leveraged for change. To leverage the power of self-organizing, we need a language and set of concepts to guide our actions, research, communications, and evaluation processes/methods. The list here is basically a vocabulary and concept list.

1. **Self-organizing/adaptive/organic:** In a self-organizing (adaptive/organic) dynamic, many semi-independent and diverse agents, who are free to act in unpredictable ways, continually interact with each other. Although these agents may be unaware that they are part of a larger whole, they are moving and adjusting to other agents and to the environment as a whole. Human networks such as the Internet are examples of self-organizing/adaptive dynamics where no leader is in

control. This is also the way ants organize, through signals from the chemical compounds of pheromones secreted by other ants.

2. **Sensitivity to initial conditions:** In complex systems, very small differences in initial conditions can have a disproportionately large impact on future events. Because of such sensitivity (and other factors), outcomes at specific times or locations within self-organizing systems are unpredictable.

3. **Emergence:** New, unexpected structures, patterns, properties, or processes emerge in self-organizing/adaptive systems. These are higher-level phenomena that unexpectedly come about from the actions of a multiplicity of small occurrences. The small occurrences were not planned to create the new order. The emergence of the new is not controlled by a single entity, but results from semi-independent interactions of many agents.

4. **Macro patterns:** When a relatively large group of semi-autonomous agents are self-organizing, they frequently create macro patterns (patterns of the whole group). These patterns are defined by underlying "simple rules." The agents are not necessarily conscious of the underlying rules of behavior and no one agent controls the behaviors.

5. **Feedback:** Agents in self-organizing dynamics are "learning" from one another and the context through feedback. As they get signals from other agents, they modify their behavior. In order to adjust the pattern over time and space, it is critical to link feedback to the underlying simple rules that create the pattern of the whole. Humans, as conscious beings, have even more complex feedback mechanisms that shape their behavior patterns.

6. **Co-evolution:** Co-evolution refers to the interdependent evolution of two or more systems within a larger ecological system. Cooperation, competition, and interdependence in relation to the same limited resources create feedback among the systems. This is another example of how agents adjust through feedback. For example, a service provider system and the community can be thought of as co-evolving when there is mutual feedback. Each system is shaping the other and shifting patterns of each system in an interdependent way.

7. **Pattern formation and points of influence:** Dynamic patterns arise among agents and between agents and their environments over time and location as *relationships, boundaries, and perspectives* change. Although the patterns are too complex to be controlled, it is possible to influence patterns by intentionally adjusting relationships, boundaries, and/or perspectives. (Perspectives refers to world views and system purposes.)

## *Implications for System Interventions and Evaluations*

The above concepts lead to rethinking how to influence complex systems.

1. **Small differences can create large effects.** If leverage points are found that shift patterns in self-organizing dynamics, small differences can lead to large and multiple effects. Any intervention in the system can be influential.
2. **The past influences but does not predict the future.** Social systems are dynamical, that is, they are continually changing in irregular ways. The more a social system is dominated by self-organizing and unorganized dynamics, the less the past predicts the future. At the same time, such a situation may provide more opportunities to shape patterns through small well-chosen actions.
3. **Many points of influence exist**. A social system is a complex mix of organized, self-organizing, and unorganized dynamics. Recognizing the characteristics of each expands one's range of options for influencing systems. To achieve social outcomes, notice the existence of each of the dynamics in the situation, pay careful attention to the differences among them, and consider how to leverage each to affect the situation.
4. **Boundaries, relationships, and perspectives are levers for influencing social systems.** When analyzing a situation to understand possible points of influence, think in terms of boundaries, differences in perspectives, and relationships (interconnections and exchanges). Consider how one or more can be adjusted or influenced to move toward or maintain a desired direction.
5. **Simple rules underlie patterns.** Synthesize what is learned about boundaries, relationships, and perspectives as ways to influence a system. Articulate flexible, adaptable rules of action (simple rules or guiding principles) that people throughout the system can use to guide their actions in multiple situations to maintain or intentionally change the deep patterns present in social systems. Simple rules are closely related to underlying paradigms and worldviews.
6. **Pattern-based feedback and action are iterative.** Because the consequences of any action in a complex system are seldom predictable, it is important to identify points of influence that tap into deep structures/processes that underlie the dynamics of a system. To shift the patterns of systems, it is essential to repeatedly (iteratively) apply feedback related to those points of influence. Because this kind of feedback links to the simple rules underlying the deep structure, it can help shape patterns.
7. **Tensions are not resolved.** When self-organizing is a strong dynamic, expect to hold some tensions rather than resolves them. Tensions such as conflict and cooperation, dependence and interdependence, and dominance and subordination continually coexist.
8. **Patterns are outcomes.** Self-organizing/ adaptive systems are not expected to produce a specific outcome at a specific time. Think instead of the desired outcomes in self-organizing dynamics as patterns of behavior that modulate and tend to stay within a

particular range of behavior. However, sensitivity to minor changes and the possibility of emergence of new patterns, structures, and properties is ever present.

## References and Further Reading

The following references are among the many that have influenced this document. They are recommended to those interested in further reading on this topic.


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Go to www.insites.org under the tab "Evaluations and Resources" for more systems oriented resources. Look particularly under the sections titled *Systems Thinking in Evaluation* and *Building Evaluation Capacity through Communities of Practice*.

## *Acknowledgements*

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The information and opinions provided herein are the sole responsibility of the author and do not represent agreement or positions of the funding agents.

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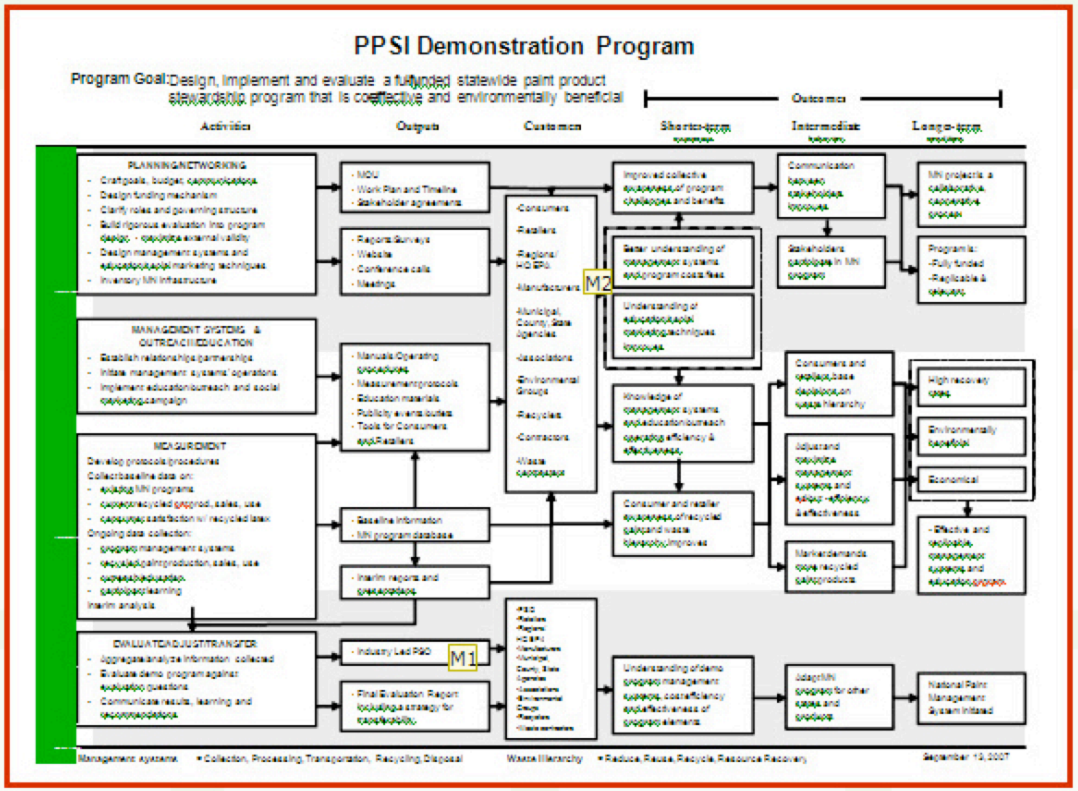
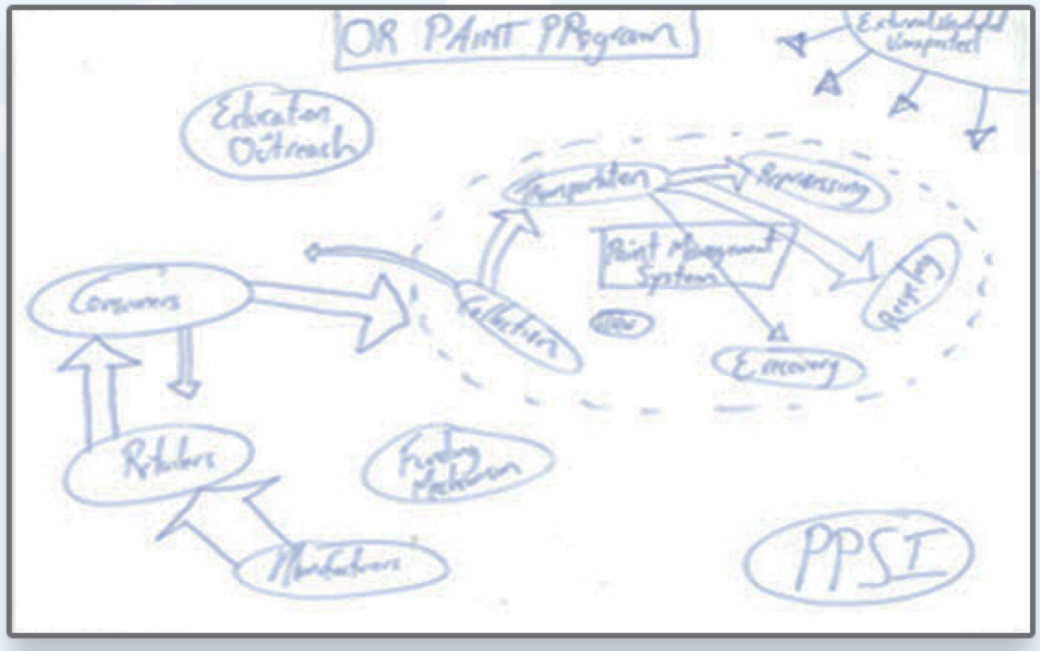
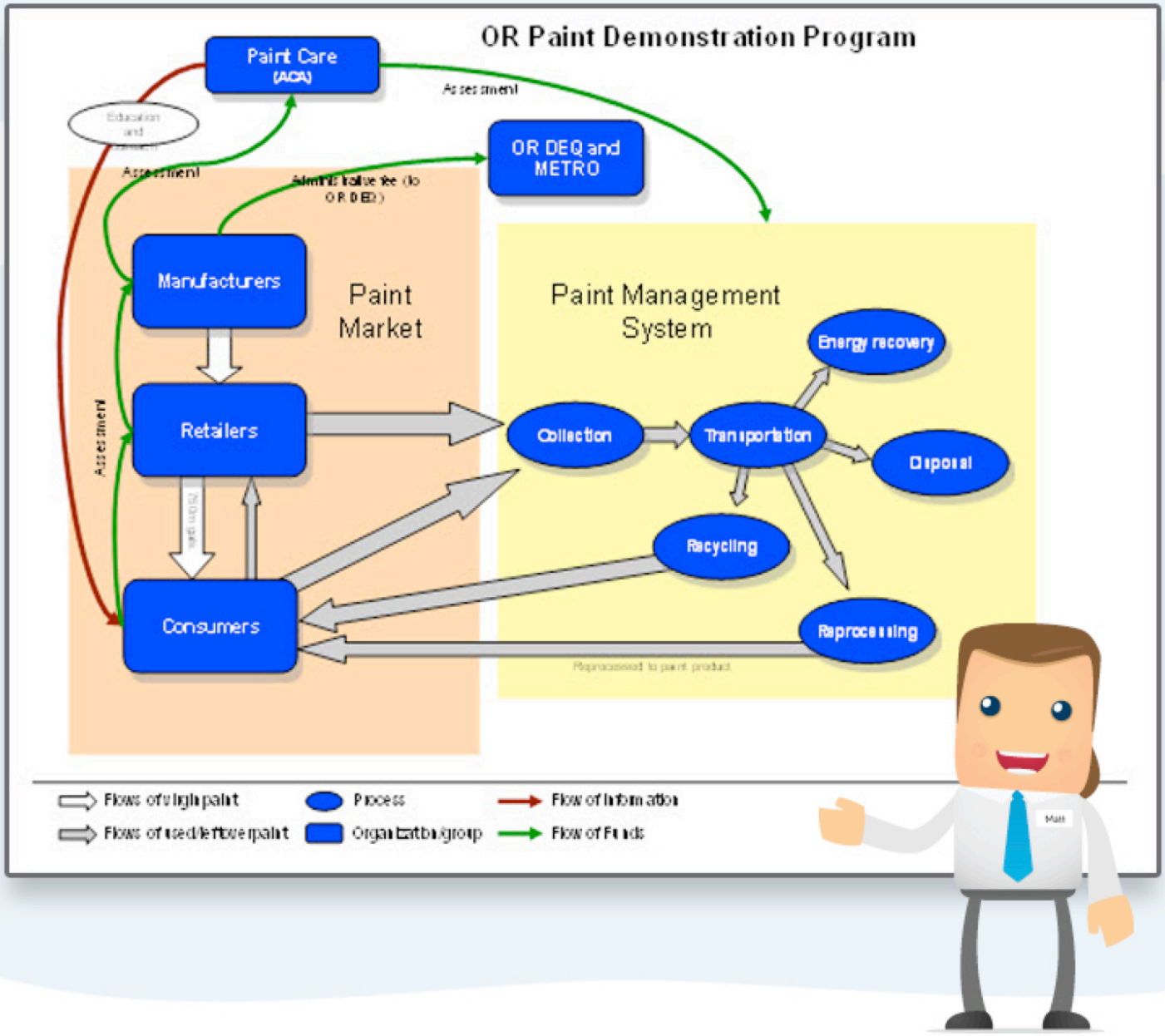
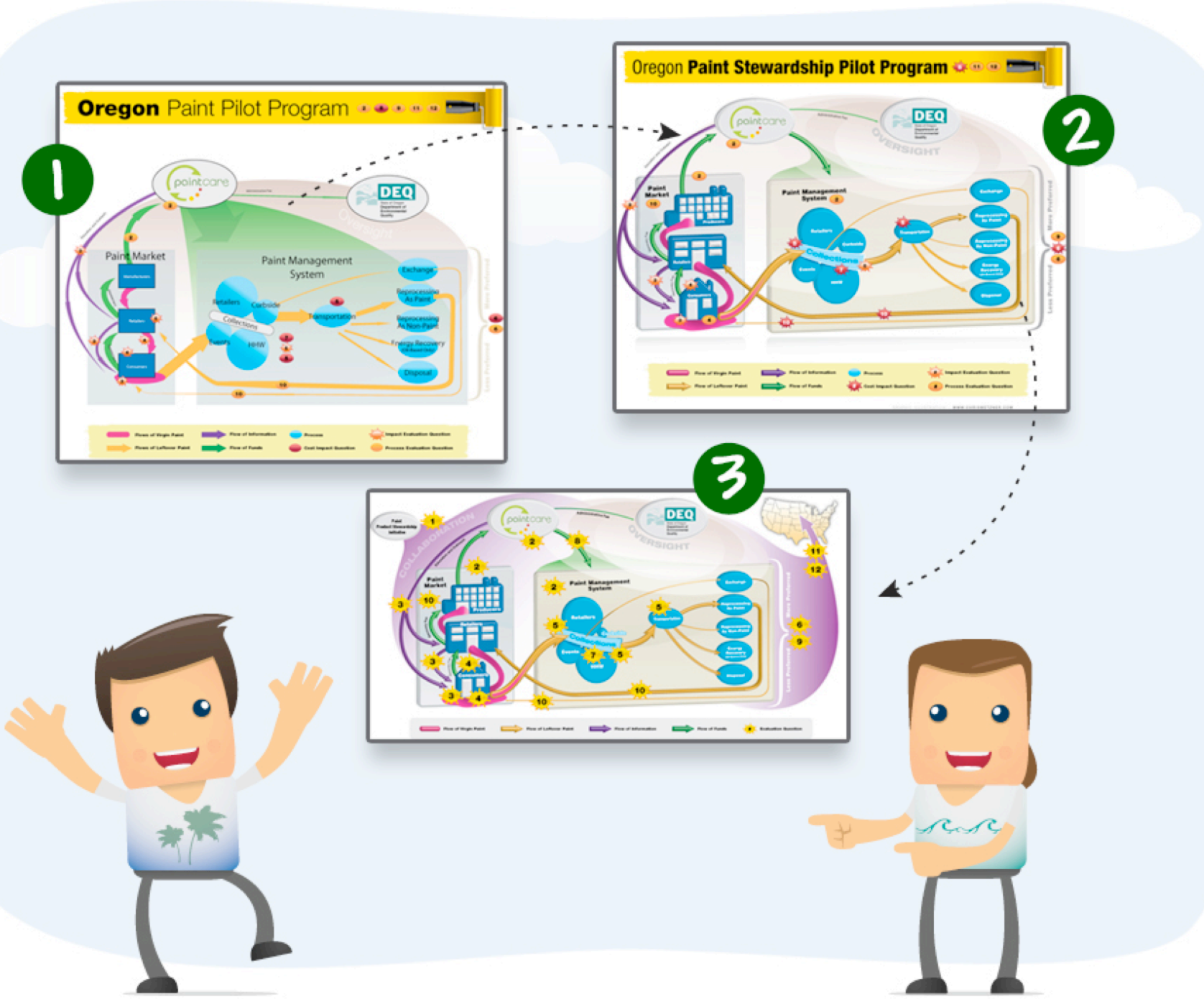

PPSI Demonstration Program
Program Goal: Design, implement and evaluate a full-scale statewide paint product stewardship program that is cost-effective and environmentally beneficial
Activities
Outputs
Customers
Outcomes
Short-term
Intermediate
Long-term
PLANNING/NETWORKING
MANAGEMENT SYSTEMS & OUTREACH/EDUCATION
MEASUREMENT
EVALUATION/JUDGMENT/TRANSFER
· MOU
· Work Plan and Timeline
· Stakeholder agreements
· Reports/Surveys
· Website
· Conference calls
· Meetings
· Manuals/Operating procedures
· Measurement protocols
· Education materials
· Publicity events/outlets
· Tools for Consumers and Retailers
· Baseline information
· MN program database
· Interim reports and presentations
· Industry Led PSO
· Final Evaluation Report: recommendations and strategy for continuation
Consumers
Retailers
Regions/ HCEPC
Manufacturers
Municipal, County, State agencies
Associations
Environmental Groups
Recyclers
Contractors
Waste generators
M1
M2
Improved collective understanding of program opportunities and benefits
Better understanding of management systems and program costs/fees
Understanding of management techniques and practices
Knowledge of management systems and education/outreach opportunities efficiency & effectiveness
Consumer and retailer awareness of recycled paint and waste management improved
Understanding of demo program management options, cost/efficiency and effectiveness of program elements
Communication opportunities and increased awareness
Stakeholders participate in MN program
Consumers and participate based participation on waste hierarchy
Adjust and maximize management options and adapt effectiveness
Market demands for recycled paint products
Judge MN program for other areas and programs
MN projects a opportunities and practices
Programs: -Fully funded -Replicable & cost-effective
High recovery rate
Environmentally beneficial
Economical
- Effective and cost-effective management options and practices
National Paint Management System initiated
Management systems • Collection, Processing, Transportation, Recycling, Disposal
Waste Hierarchy • Reduce, Reuse, Recycle, Resource Recovery
September 13, 2007

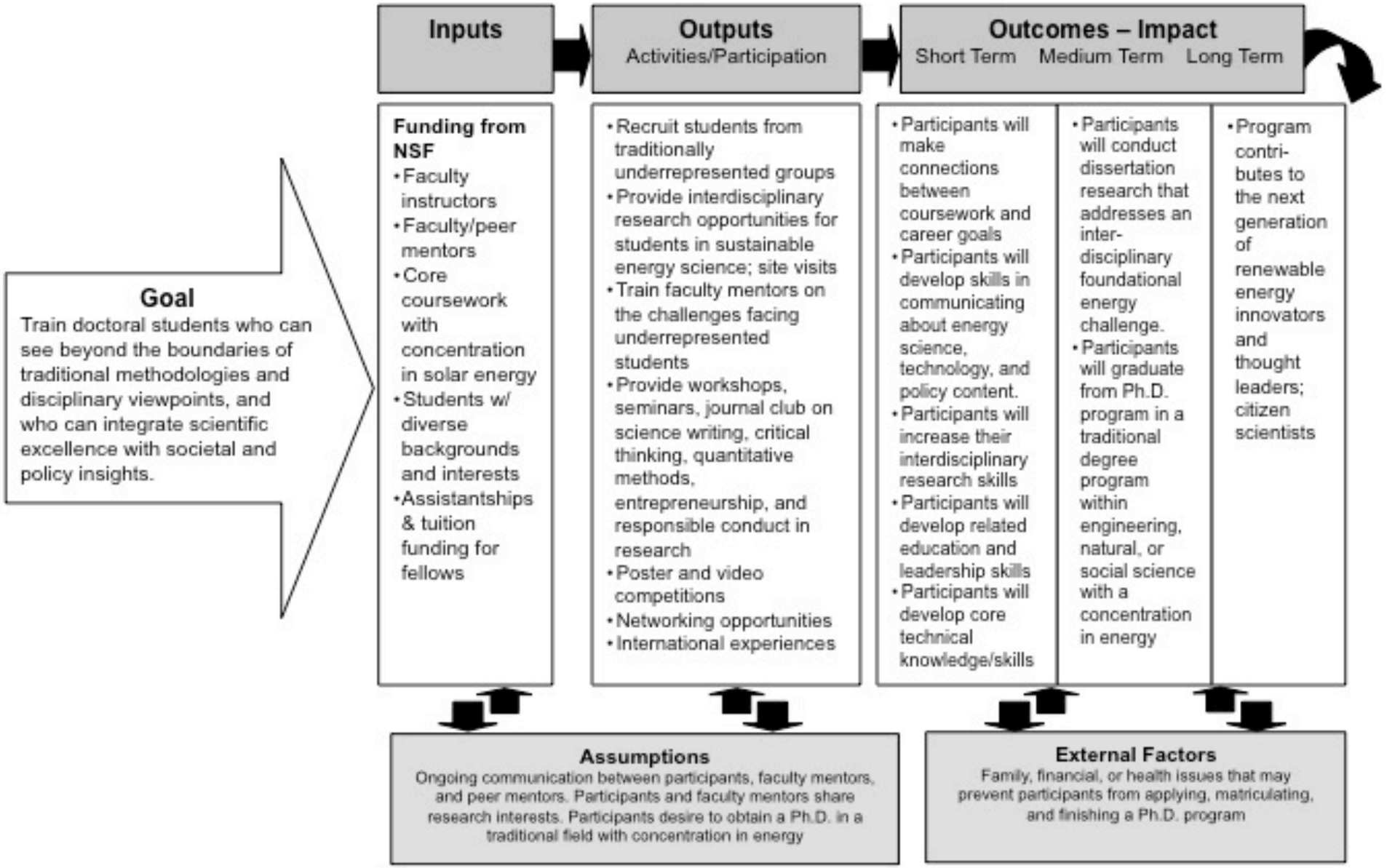
- ✔ Actors involved
- ✔ Processes
- ✔ Products
- ✔ Information
- ✔ Goals
- ✔ Systems
- ✔ Connections





OR Paint Demonstration Program
Paint Care
(ACA)
Assessment
OR DEQ and
METRO
Manufacturers
Paint
Market
Paint Management
System
Energy recovery
Retailers
Collection
Transportation
Disposal
Recycling
Consumers
Reprocessing
Assessment
Process
Flow of Information
Flow of Funds

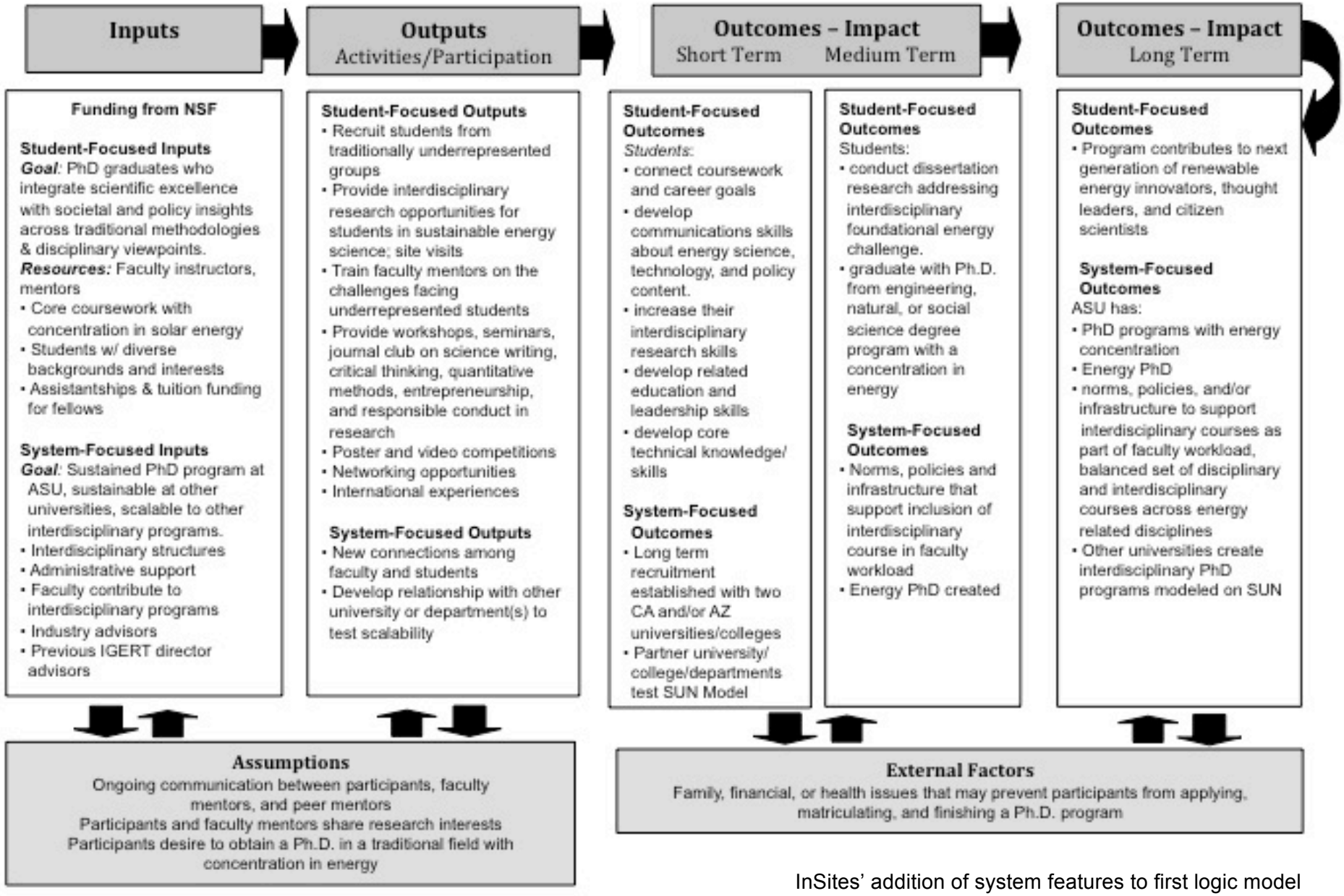

1
Oregon Paint Pilot Program
Paint Market
Paint Management System
Retailers
Curbside
Collections
Events
HHW
Transportation
Exchange
Reprocessing As Paint
Reprocessing As Non-Paint
Energy Recovery
Disposal
2
Oregon Paint Stewardship Pilot Program
3

# IGERT SUN Logic Model (Student & Program Focused)

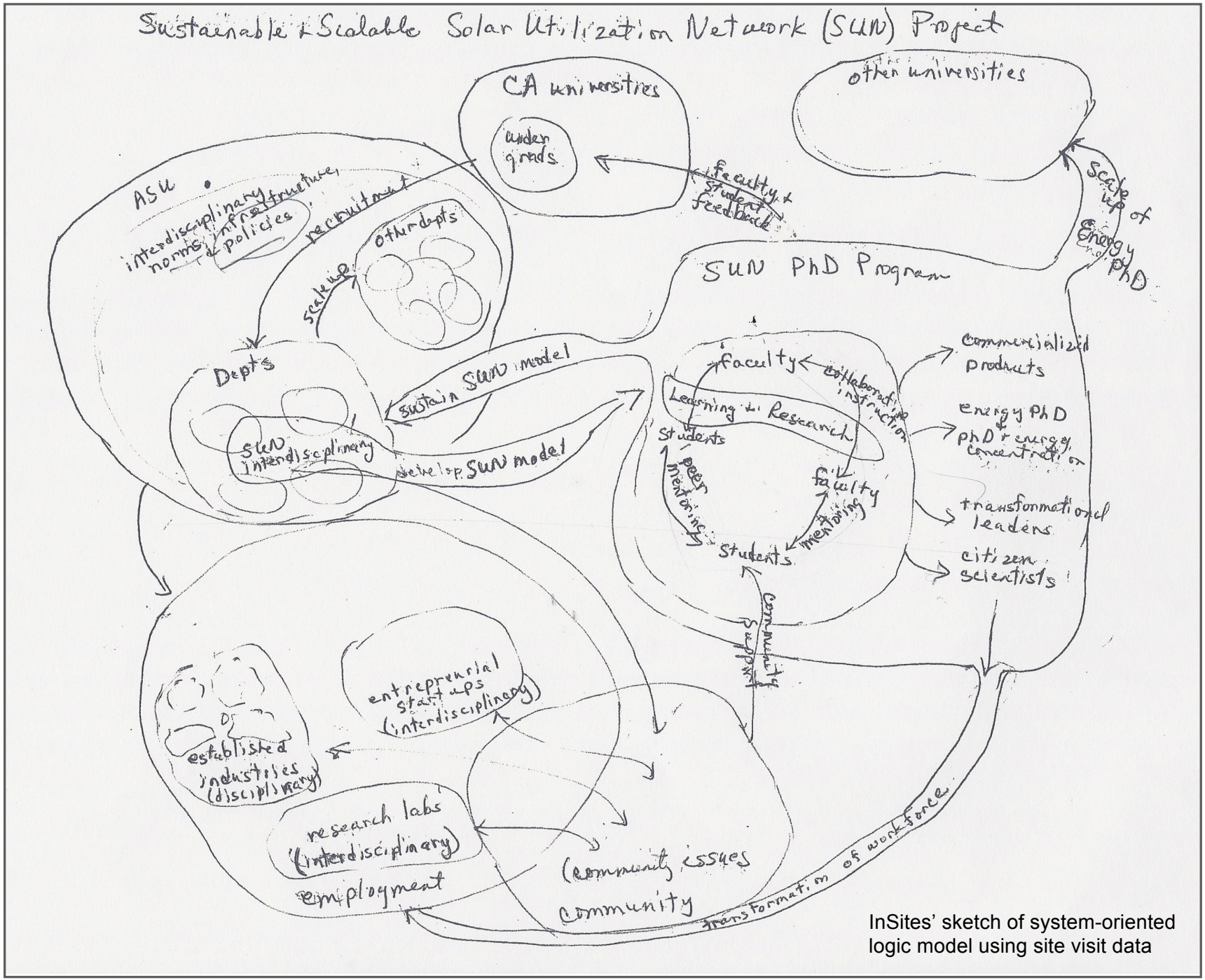



Early logic model developed by ASU internal evaluation team

# IGERT SUN Logic Model with Systems Focus Added

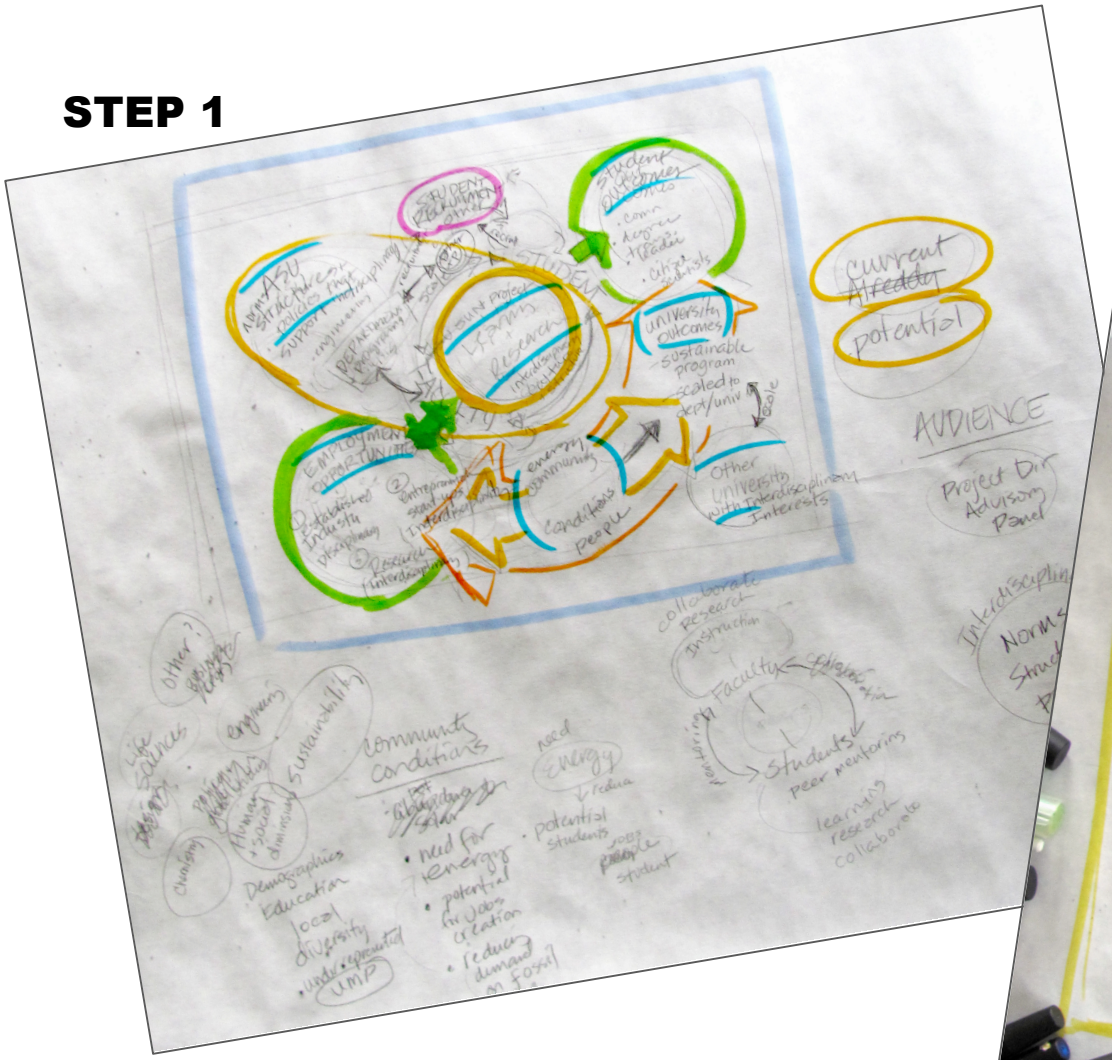



InSites' addition of system features to first logic model




InSites' sketch of system-oriented logic model using site visit data

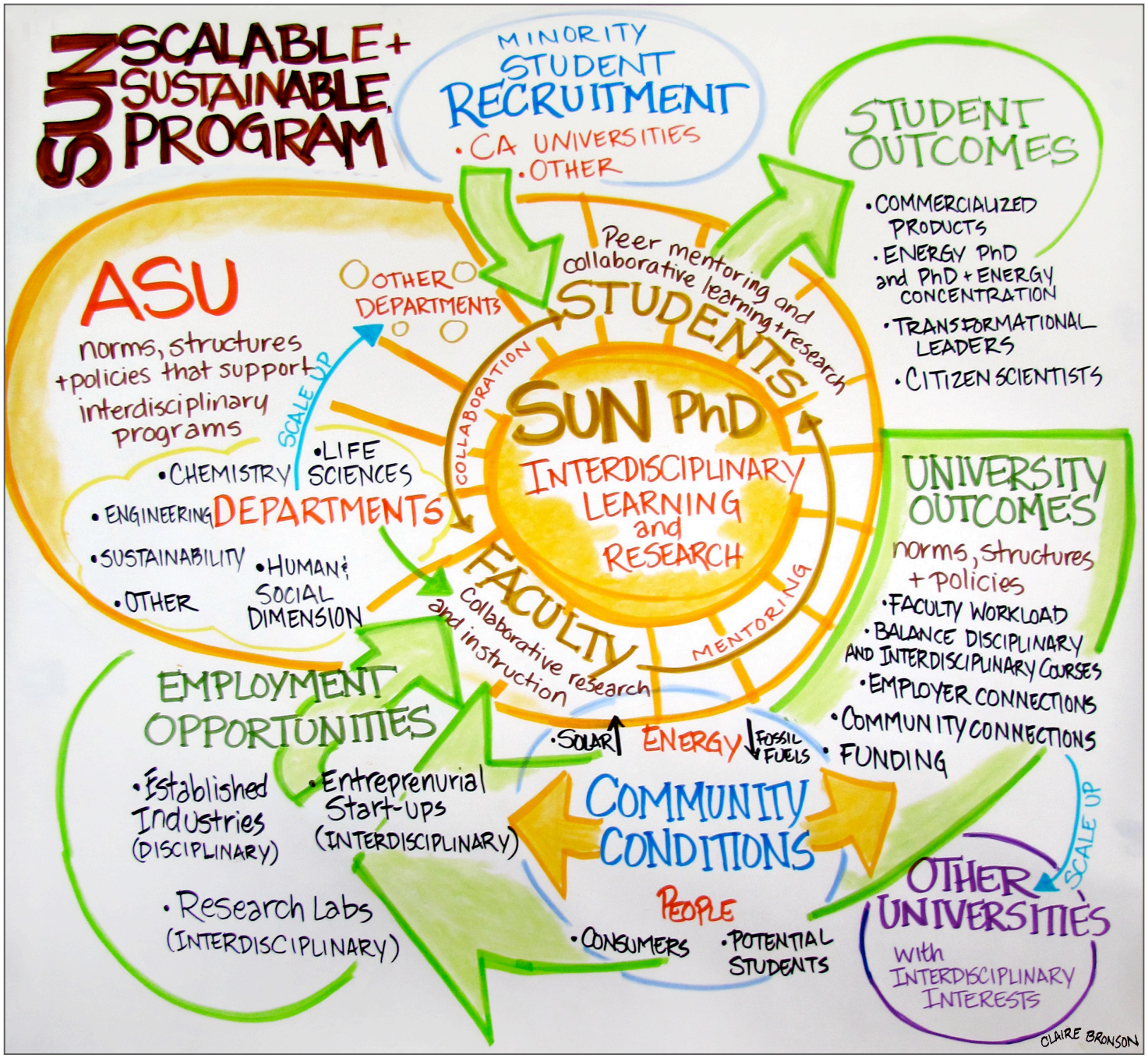
**STEP 1**





**STEP 2**

InSites' evaluator and graphic facilitator's noodling about graphic (fuzzy logic model)




Graphic (fuzzy) logic model included in InSites' first year external evaluation report on sustainability and scalability

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# Questions that Matter: A Tool for Understanding Dynamics in Complex Situations

The following questions are designed to help evaluators, planners, and implementers of change initiatives to work with complex situations and systems. The questions assume that a definable "intervention" is being contemplated, implemented, or studied/evaluated in the situation. The boundaries of the intervention may be relatively fixed or very permeable. The questions draw attention to boundaries, relationships, and perspectives/differences within complex systems/ situations that create patterns that can be influenced.

| Conditions Creating System Dynamics | Example Questions to Ask |
|---|---|
| **Boundaries**: Boundaries are demarcations that create a region or entity. Boundaries can refer to physical entities, organizational identity, social systems, rules of conduct, and other demarcations. Boundaries may be permeable to allow exchange with the environment and also impermeable in that they distinguish the system or other entity from its environment.<br>*Focus/direction:* Focus may refer to specific short and/or long term outcomes that are sought, a general direction in which a system is moving, or some combination of these. | How changeable/stable/permeable are the boundaries of and between the interventions and its context/situation? |
| | How are the boundaries changing among the organized, self-organizing, and unorganized dynamics of the intervention and its context/situation? |
| | What changes in boundaries would bring new creative energy or stabilizing energy into the work? |
| | What are the few important areas to focus on for the intervention at this point in time? |
| • *Resources:* Resources refers to the human, financial, physical, and other resources that can be used to move in a desired direction.<br>• *Time and Location:* Change happens over time and may vary depending on the location in which it is occurring. | What new desired outcomes or directions are being identified? |
| | Are the criteria for success changing? |
| | What resources are available to contribute to the desired direction? |
| | How do changes in time, location, and resources affect boundaries of the intervention and its context/situation? |
| | What is the rate and nature of changes/differences in patterns or conditions across time? Across locations? |
| | What shifts are needed in resources to continue toward the goal and/or in a desired manner? |
| **Relationships (interconnections)**: Relationships refers to the connections and exchanges that exist among bounded parts of a system. Interconnections/relationships tend to be key aspects of forming patterns. The connections may be as, or more, important than the entities making up a system. Some relationships form systems such as hierarchical systems, networks, families, communities, and social groups. Cause and effect relationships are another type of relationship. | What relationships appear to be contributing to meaningful results or conditions? |
| | What are the relationships/connections among the stakeholders? |
| | How might changes in relationships affect the short and long term outcomes or general direction of the work? What feedback loops are built into the project/initiative and the larger system? |

| Conditions Creating System Dynamics | Example Questions to Ask |
|---|---|
| **Perspectives/Differences/diversity/energy:** Perspectives refers to worldviews and purposes. Different stakeholders may have different perspectives on a given situation AND all those within a given stakeholder group do not necessarily has the same perspective. Differences create energy. It may be negative or positive from various perspectives but the energy gives the potential for movement. Diversity tends to create energy. When looking for differences that matter, look for the nature of the energy within a bounded region. | Is there sufficient diversity in the self-organizing units to stimulate creative ways of addressing challenging issues? |
| | What are the important power dynamics in the intervention or between the intervention and its context/larger system? |
| | Where is energy being created? Where is it stagnating? |
| | What variation in perspectives (worldviews and purposes) are present within the work and what are the patterns of where they exist? |
| | Is there sufficient diversity in the self-organizing units to stimulate creative ways of addressing challenging issues? |
| | What shifts are occurring in the acceptance and spread of new project philosophies? |
| | What variations exist in whose expertise is valued? |
| | Are stakeholders missing or avoiding an important perspective? |
| | What new definitions of diversity may help provide the basis for stimulating movement in the desired direction through self-organizing means? |
| | Are new perspectives (worldviews) arising within the project? |

*Questions that Matter: A Tool for Working in Complex Situations* is part of a series of tools developed by InSites (www.insites.org). The series is designed to support those engaged in learning, inquiry, and practice within complex social settings.

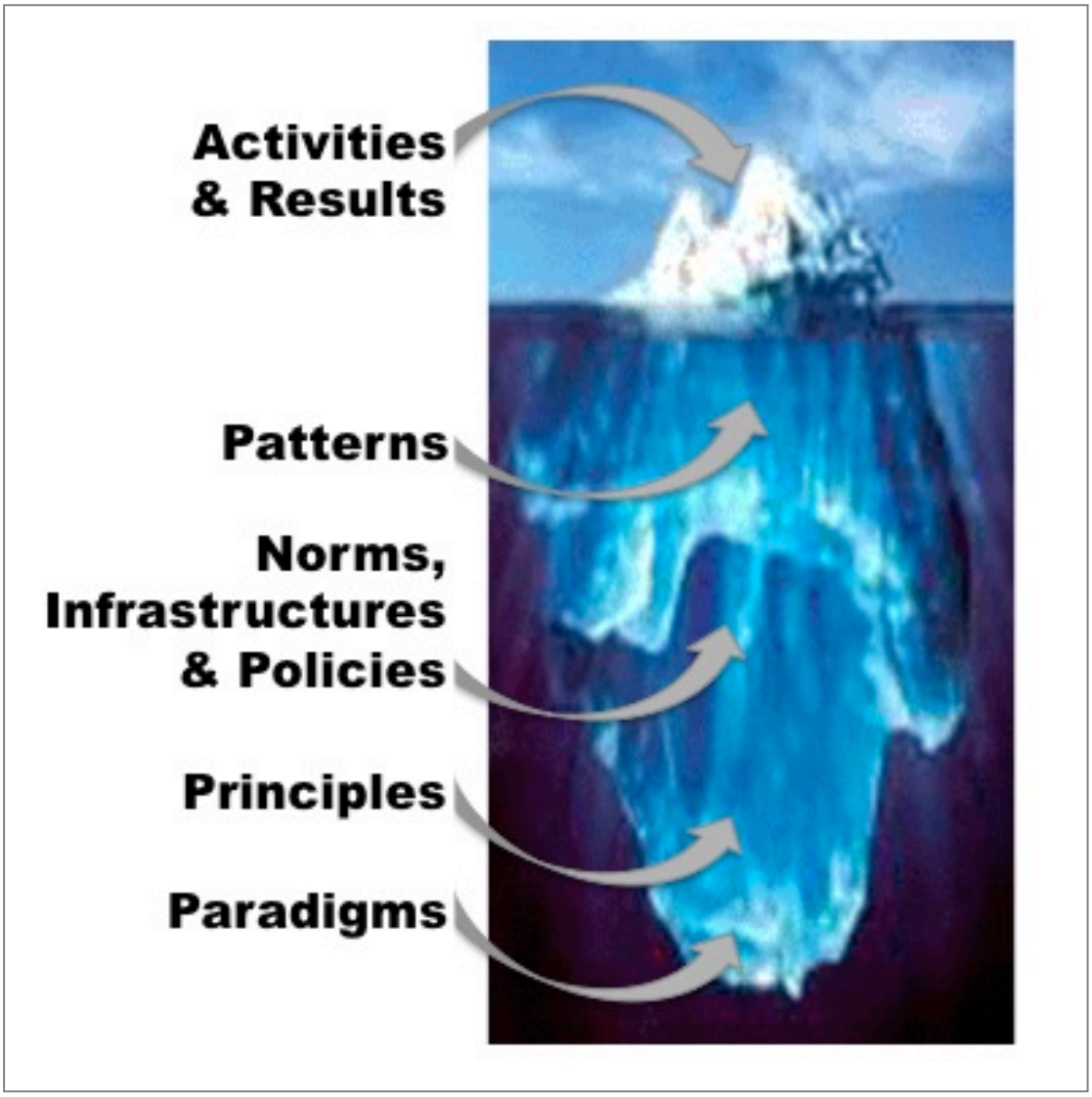
Reference:

Parsons, B. and Jessup, P. (2011). "Questions that matter: A tool for understanding dynamics in complex situations". Ft. Collins, CO: InSites.

For more information, contact Beverly Parsons at bparsons@insites.org . She lives in Washington state near Seattle.

# Using the Iceberg Diagram to Understand Complex Systems

## (Illustrating Visibility and Depth)



# Session Feedback

*Please respond to the following questions at the end of our session and leave this feedback sheet on your table. Your feedback is **very important** to us.*

1. What concepts, activities, or tools discussed today would be helpful for AEA to make available to its members through webinars?

2. Would you be interested in being part of a Community of Practice about taking a systems orientation to evaluation?

   _____ yes _____maybe _____ no

   If so, please provide your name and email address:

   Name _____ Email _____

3. If you answered yes or maybe to question 2, what format for the Community of Practice would work well for you (e.g., monthly webinars, monthly webinars + annual in-person meeting, quarterly meetings, conference calls)?

4. What other suggestions do you have about building evaluators' capacity to use a systems orientation in their work?