# *A Framework for Decision Making in Social Innovation Labs*

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*Ring the bells that still can ring*
*Forget your perfect offering*
*There is a crack in everything*
*That's how the light gets in.*
*-- Leonard Cohen*

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***A Framework for Decision Making in Social Innovation Labs***

## *Introduction*

This paper proposes a framework for decision making in the context of social innovation labs focusing on the appropriate use of data visualization and simulation to support the process. A key goal is to help participants see the system, identify barriers to change, discover potential innovations that could leverage cracks and opportunities in the system (Smith, 2007) and decide on the intervention(s) best suited to meeting the desired outcome. This framework builds on learnings from the first Social Innovation Labs work performed for SIG@Waterloo as well as my experience with data visualization and simulation techniques in the field of business intelligence and computational sustainability. I will utilize the concepts of complex adaptive system mapping, basins of attraction, social innovation labs and theories of behaviour change to ground the discussion. I conclude with some critiques of the current Social Innovation Labs context including the "…danger of using figures, which always simplify to highlight particular points." (Geels, 2007), the limitations of a small-group focus on policy makers and challenges of using currently available tool sets that do not adequately support the decision making process.

## *A Framework For Open and Transferable Solutions Lab Simulation and Data Visualization Processes*

### *Overview*

In the process of a Social Innovation Lab, there are a number of steps a group needs to move through in order to come to solutions that are not only innovative, but are acceptable to the group and feasible to implement. I have defined these as stages of exploration below. I have also mapped this to our project team's work-in-progress idea of facilitating the creation of a National Citizens Energy Strategy (NCES). This will be built out of a set of cross-country, cross-sector engagement processes taking full consideration of economic, environmental and social concerns. The process and delivery designed to be factual, transparent, science based and at the same time accessible and relevant to the general public and will include Social Innovation Lab-style events in addition to a range of public engagement activities. Outcomes will be actionable by all sectors - individuals, corporations, non profits and multiple levels of government. This will produce not just a report that needs to be approved but a set of actions for implementation.

The first phase is gaining a shared understanding of context. Before participants in a Social Innovation Lab can start discussing potential solutions they need to have a common understanding of

the state of the system, what the current issues are and the parameters that might be changed. It is also critical that participants share an understanding and agree on the problem to be solved and an early attempt at some criteria for a successful system. From a Design Thinking lens, this is the importance of having the right question. Moira Quayle, Director of the d studio at UBC, highlighted this as a key challenge in their Design Labs (Personal communication, December 19, 2012)

In the context of the NCES, citizens from all backgrounds need a way to explore the current system, ask questions, test assumptions and understand relationships. We have many different actors connected to the energy system in Canada and these actors often have different interpretations of the current state. The NCES must provide ways (using a range of media to engage a range of stakeholders) to understand the current system. Most public dialogue processes are focused on this stage of the process.

The second stage in the process requires exploration and is very much a divergent stage. In design thinking parlance, "divergent thinking is the route, not the obstacle, to innovation" (Brown & Wyatt, 2010). A challenge at this stage is encouraging thinking and exploration that pushes the edges of the current system. "The natural tendency of most organizations is to restrict choices in favour of the most obvious and incremental." (Brown & Wyatt, 2010). A challenge in implementation of this part of the process is that participants will likely arrive with preconceived ideas of the alternatives available. A key goal of the NCES is to expand the solution space - to allow participants to discover alternatives, combine options into new alternatives and start to see the relative benefits of each.

At this stage, participants must be encouraged to think about what are the measures of success – how will the group test the various alternatives that are generated? What might be some variables put in place to evaluate the alternatives and make a decision? What is needed is a set of tools that allow Labs participants to explore policy options and see interactions between variables and system impact (M. Tovey, personal communication, November 29, 2012). A challenge from a technology viewpoint is that while there are a range of extant tools,

> "A far smaller portion of simulations leaves it s interface open and clearly explains it limitations so that designers and decision makers can modify the assumptions or the inputs as part of thinking through their response [to] a problem. Even fewer make these capacities so accessible that groups can use them constructively to build and explore models together" (Westley et al., 2012)

What could such a policy explorer look like? One would need software that can evolve with the evolution of system understanding. Tools that can link the visual metaphors of complex adaptive system maps and the basins of attraction hold much promise and will be addressed later in this paper.

The third stage is where participants must come to agreement on which policy intervention, prototype or idea to move forward. In this stage of the process, participants must start to filter and converge on solutions. Tools must be provided to help participants with cost benefit analyses. These tools will also help participants in deciding what are the relevant criteria for evaluation for example

incorporating social and environmental impact. Fraser describes a heuristic for determining and visualizing these criteria.

In addressing the challenges of identifying and deciding upon options, Fraser points to a heuristic that starts with looking for "indicators of vulnerability" (E. Fraser, personal communication, November xx, 2012). Examples of this might be an increasing use of technologies to increase yield or the shift from diverse planting to specialized agriculture. These indicators can be mapped as dimensions on a chart and assigned numeric values. For example, an indicator of agro system resilience might measure ecosystem services like pollination, concentration of production. An indicator of livelihood richness and diversity might leverage the Gini coefficient of income inequality. These indicators can then be plotted over time. When changes start to occur on multiple dimensions, a "convergence of stresses", the system is at serious risk of collapse and smaller and smaller problems will have bigger and bigger impacts. Interventions may be placed into the categories, in the agriculture example, of technology, management, local food and regulatory. Each category of intervention can then be assessed as to the likelihood of impact the range of indicators of vulnerability. (This section draws on both Fraser, 2007 and Fraser, personal communication, November 26, 2012). However, this is rarely an either or choice. Often a portfolio approach, or bricolage, has the best chance of impacting the system (Gundry et al., 2011). In complex adaptive system especially, it is unlikely that a single intervention focused on a single system variable will have system wide impacts.

Timmer & Dixon propose an alternative taxonomy of decisions in evaluating best bets or system leverage points (V. Timmer, personal communication, December, xx, 2012). In the first category are those innovations that might have the highest quantitative impact. For example, building retrofits might have the biggest impact on reducing CO2 in Canada. However, there may be serious challenges to implementing an innovation of that type. An alternative rubric is to look for areas of accessibility and readiness by asking where there are the least barriers to action, where are the conditions ready, what coming system shocks can we prepare for? Innovations in this space may not have as large a quantitative impact but are more easily adopted and have the potential to prepare the dominant regime for further change. A third category is that of symbolic interventions. Examples such as sharable tool libraries will not overnight change our system of consumption but can be emblematic of a bigger change, in a sense serving as *prefigurative* action (action that provides a model or early representation of what systemic change could look like) for system change (S. Quilley, personal communication, November, 23, 2012). Finally there are the options that one may choose in order to create, nurture or sustain alternatives. Here we are taking the approach of making the innovation basin of attraction more stable and resilient in preparation for system change.

Various tools and techniques exist for decision making however there are new tools emerging such as Ethelo, designed for large scale public decision making based on principles of "fairness" rather

than consensus and tools developed by Chamberlain and Carenini at the Institute for Resources, Environment and Sustainability at the University of British Columbia for multivariate decision making in a visual interface (Personal communication, October 12, 2012). These tools attempt to both use visual techniques for decision making and ensure understandability and accessibility for decision makers.

A difficulty in using these, or any tools, for deciding on which innovation to pursue is the uncertainty caused by the "dance between deliberation and emergence" (F. Westley, personal communication, November 22, 2012). The phrase indicates that a model assuming innovations will remain "pure" once released into the world is fundamentally flawed. There is an inherent tension of examining how well an innovation is designed and assessing its attractiveness (ability to attract resources) and degree of radicalness (likelihood of attracting resistance) on the one hand and on the other the knowledge that innovations may change or be "corrupted", adopted by the dominant regime (Smith, 2007) or be rejected by the system in the phenomenon of rememberance (the phenomenon of a system reverting to the dominant regime state) (Westley et al., 2006). The innovation may change but the goal is coherence of design rather than consistency, which only works for complicated vs. complex systems (F. Westley, personal communication, November 23, 2012). Once again, Gundry et al. raise the point that no single alternative will be sufficient (2011). Design - not just the elements but the relationship between – is, like bricolage, bigger than the sum of the parts

The final stage, often after the Lab is complete, is implementation. While not technically part of the labs process, if this stage is not considered, the result of all the hard labs work may come to naught. Issues of feasibility (which should have been considered in the earlier design phase) and innovation translation (Smith, 2007) must be addressed. This stage is where the difficulties of having a limited subset of the system in the room become an issue. As will be addressed later in this paper, unless system actors that have direct ability to affect an issue are present, there is serious risk of any outcomes becoming actionable. Born references this approach when recommending that convenings should include representation from the private sector, public sector, non-profit and those with lived experience of the issue being discussed (2008). Note that this is different from stakeholder engagement. Here we are talking about engaging not only those who might need to be consulted due to legislation or regulation, but those that are actively working on system change whether they be activists, institutional entrepreneurs, NGOs, private sector leaders, elected officials or policy makers.

# *Social Innovation Labs*

## *Overview*

Social Innovation Labs (SILs) are an attempt to provide a "rich conceptual ground for the development of breakthrough solutions to intractable problems arising in the context of complex social and ecological system interactions." (Westley et al., 2012). As defined in Westley et al. these labs come out of a tradition and integration of four key areas: "group psychology and group dynamics; complex adaptive systems theory; design thinking; computer modeling and visualization tools." Westley notes that the SILs should include a cross scale focus looking at landscape, regime and innovation niches, provide a whole system focus, make full use of research and integrate the best techniques from change and design labs (F. Westley, Personal communication, November 24, 2012).

The concept comes out of realization that whole systems processes like Future Search have limitations. Event though Trist was correct in identifying that a whole systems approach was needed saying "we acted like systems in creating large system problems, but we acted like individuals in trying to solve them" (cited in Westley et al. 2012) – just having the system present (if even possible) was not sufficient to provide innovative solutions to large scale social innovation challenges. One can see this individual approach in many areas of social change. Social change organizations work independently and competitively rather than cooperatively. While one could see this as a natural process of niche innovations in an evolutionary process towards alignment and dominance of one innovation (Geels, 2007), the practical consequences are many wasted resources and little actual regime change. Social Innovation Labs hold the promise of providing a catalyst for the linkage of formal and informal or "shadow" networks (Westley et al., 2011) towards cohesion. If this promise is fulfilled, Geels (2007) would predict an acceleration towards regime change with an aligned set of innovations. However, Smith (2007) might argue that there is a risk of coming to alignment too soon which is also a key tenet of design thinking (Brown, 2009). What may appear to be chaotic and uncoordinated processes from one viewpoint may be a necessary phase of actors exploring the system, identifying barriers to system change and looking for the "cracks" or opportunities those barriers may present (Smith, 2007). A potential bridging of these approaches is proposed as "Open Source NGO Coalitions" whereby loosely coupled networks of NGOs can rapidly coalesce around an issue, aided by the rise of Internet-based communication and organizational tools, based on agreements to core principles versus formal integration (Williams, 2010)

Design Labs processes also have limitations and can often be technocratic, with a focus on making outcomes practical but without the broad input or consideration of whole systems (Tovey, Personal Communication, November 30, 2012). Design labs are also not always best suited for looking at challenges beyond creating "things" such as products and looking at social issues such as child

poverty. Usually with a specialized physical environment, the labs attempt to bring in a multi-disciplinary group of experts to address a particular problem with a goal of "co-creation of solutions from diverse inputs" (Westley et al. 2012).

SILs attempt to merge the best of these approaches with an emphasis on prototyping with qualitative data, stories, pictures, etc. As proposed by Westley et al. (2012), the goal is to open source as much of the process as possible. My interest in this paper is to propose a framework whereby simulation and visualization can be leveraged to facilitate the process in future labs. At the same time, I wish to highlight an inherent limitation of Labs – only certain people are present. Asking questions such as "is the whole system in the room?", "Who has access to the lab?", "Are the people who can actually make change happen there?" and "How can 12 people in a room make meaningful change?" are critical to the adoption of SILs that will lead to lasting social innovation.

It is important to clarify the distinction between a "Solutions Lab (for example, a proposed physical space at MaRS in Toronto, which may or may not use the SI lab methodology), and a Social Innovation Lab, which is a generalized methodology not attached to a particular space." (M. Tovey, personal communication, January 22, 2012) Critiques of a particular instantiation of a Solution Lab may not be representative of the Social Innovation Lab as "a methodological innovation that brings together elements of both whole systems processes and design labs." (Tovey, 2012)

## *The Role of simulation and Visualization in Social Innovation Labs*

At its simplest, data visualizations can help Labs participants gain an understanding of the current state of the system. "Tools for producing infographics that clearly show the relationships between different data are becoming much more widely available [such as those by Hans Rosling]" TED, 2006. cited in Westley et al. 2012). Examples of this can also be seen at sites such as Informationisbeautiful.net and VisualComplexity.com. Even before common understanding of a system, it can be useful to visualize and gain consensus on the desired outcomes of system interventions. Sometimes this is as simple as surfacing assumptions and driving a discussion around these.

As an example, the model below illustrates the impact of various development choices on a local community's goals. Communities are often faced with the challenge of evaluating the impacts of development opportunities. More than that, communities must decide what is important (creating jobs, earning revenue, plugging leaks in the local economy) and how to balance these competing demands. This model provides a simple illustration of a model to do just that (Williams, 2009). In this scenario, a community has come up with three investment options:

- Start a Green building company
- Create a landscaping company

- Invest in job skills training

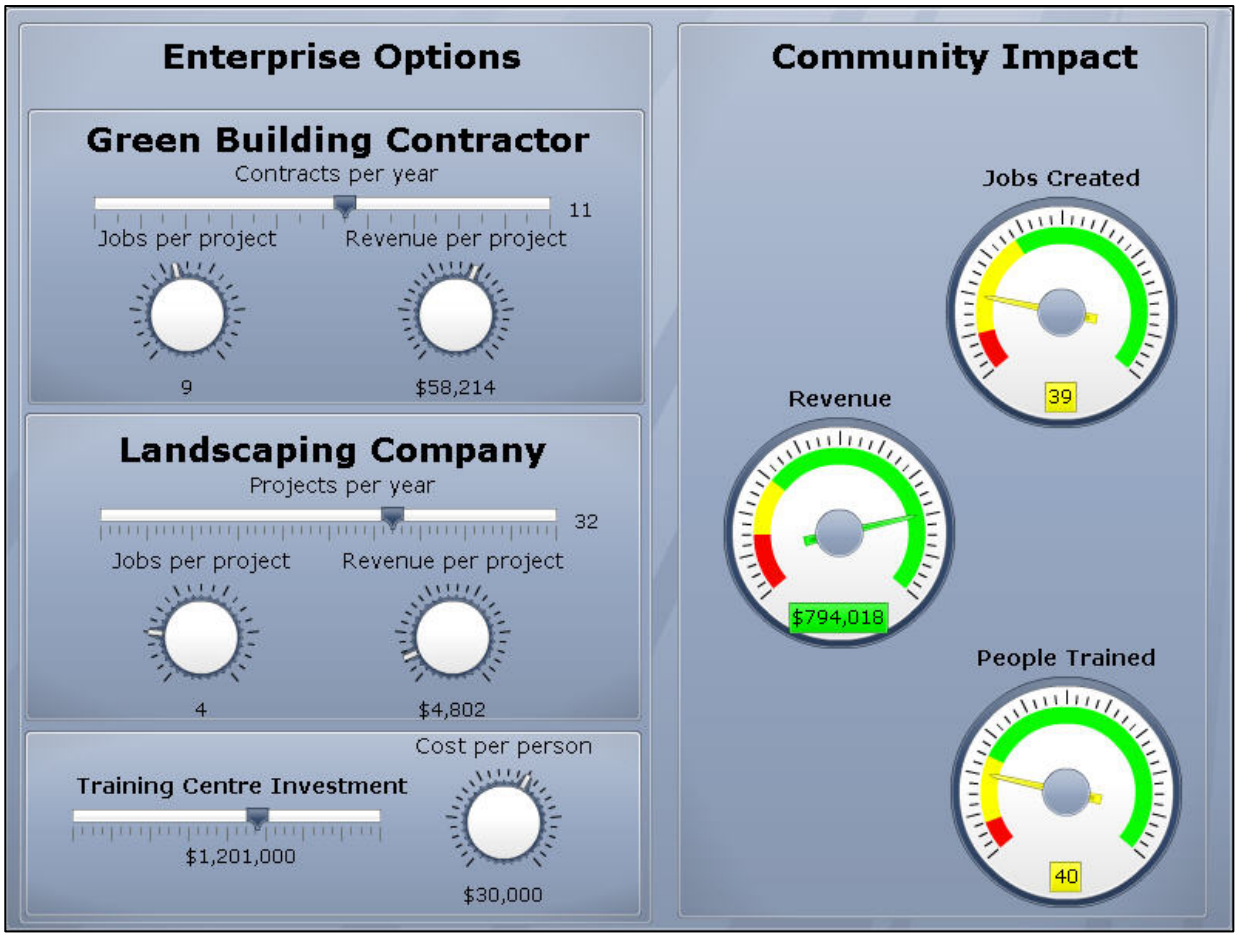



**Figure 1: Community Economic Development Impact model.(Williams, 2009)**

In this example, success will be measured by the number of jobs created, the amount of annual revenue and the number of community members receiving job training. By changing assumptions about how much revenue and how many jobs are generated by each option, the community can immediately see the impact on goals. More importantly, the model surfaces the goals for discussion. Community members are forced to consider the relative importance of each goal, the balance between the goals and also the assumptions behind the enterprise options. In this example, there are linear interactions between the variables and there is little connection between the various options. These types of models can be very useful when making decisions between alternatives that have been generated at an earlier stage. While useful for discussion purposes, if we wish to model complex adaptive systems, we must look to more complex data visualization techniques.

As Westley et al. state, "Simulation and visualization is an area that has tremendous potential for helping people to understand complex systems" (2012). They go on to say that while "mapping and prototyping is already widely used in design processes…future work *will make better models that are easier for participants to manipulate*, and will more deeply embed compelling visualizations into the

toolset to support Change Labs" (emphasis added). The use of simulation and visualization has a rich history in this context. Forrester and colleagues at MIT have been building systems dynamics models (Richardson, 2011 cited in Westley et al., 2012). The use of "feedback supporting a person to change behaviour" came from "WWI and WWII control theory models that included feedback to help planes fly better" (Lewis, 1992 cited in Westley et al., 2012). The emergence of parametric modeling provided a more flexible interface getting closer to modeling a complex system. "In a good parametric model, changing just a few variables can transform the whole system" (Woodbury, 2010 cited in Westley et al. 2012). However, a key limitation of parametric modeling (or any model for that matter) is that the variables, relationships and system can only be changed in ways that have been anticipated by the model designer and the limits of the technology used for the model.

Westley et al. cite the examples of Conservation Breeding Specialists Group (CBSG) that "…developed a tool that let policy makers make decisions in simulation and understand the effect those decisions could have on particular species. These proved remarkably effective for increasing decision makers' understanding and as a tool to support decision-making" (Lindenmayer, et al., 2000 cited in Westley et al., 2012) and John Robinson and Jonathon Salter at UBC (Tools for Modeling, Visualization and Community Engagement, 2011) who "developed visualization software to be used with members of the public and decision makers to understand the implications of their own action beliefs and values" (cited in Westley et al., 2012)

One of the reasons why the tools and models have been challenging to develop is that in typical design processes, the result is often a "thing" - easy to see, build, and have control over. Prototypes can easily be built and models tend to be linear and predictable. Designing at a system level is harder to prototype and can be very expensive, although not necessarily so. The variables and relationships are complex, results are nonlinear and the system is inherently difficult – if not impossible - to model completely. This is a core feature of the irreducible complexity of complex adaptive systems (F. Westley, personal communication, September 30, 2012). One of the characteristics of complex adaptive systems is the unpredictability and sensitivity to system shocks. Taleb argues that it is impossible to accurately predict the likelihood of system shocks and that the best a model can do is assess the fragility of a system (2013).

Given the complexity and expense of building prototypes, these models are often not really treated as an experiment to learn from what worked and didn't but rather as a solution to be implemented. The power of good visualizations is for both seeing systems and experimenting with systems. Models can be built that allow participants of a lab to "test" out solutions. The concepts of rapid prototyping are very useful here as per Harrelson (2010). Harrelson outlines three principles for effective prototypes:

- **Fast:** allowing for rapid iteration (and feedback)
- **Disposable:** enough to express the idea to be communicated, and no more

- **Focused:** selecting the most important things to test – such as significant "unknowns" or complex elements (cited in Young, 2010)

These models are not necessarily scientifically valid but still can be incredibly informative to play with as simulations. The intricacies of complex adaptive systems can be hard to hold in ones head so interactive models can be useful to ask "if we do this, what is the impact on that?", "what is connected?", "what goes up?", "what goes down?". Even if the answers to these questions are contentious, the discussion around these variables and their relationships can be hugely valuable in forming a common understanding of the current system. I will describe this in more detail below.

The concept of Social Innovation Labs is to engage the whole system. However, the initial focus of many Labs is of policy makers as participants. While this has limitations (as will be discussed later), it does allow us to make some predictions about what might be useful areas for simulation and visualization to play a role. Simulation can be useful to illustrate political horse trading by offering a sense of the pushback that might occur given a certain policy intervention. Simulation can also ground decision makers in risk and allow an understanding of the variability (M. Tovey, personal communication, November 30, 2012). In essence, the impacts become intuitive. This can allow decision makers to come to agreement on what the policy actually is (variables, assumptions). Tools using the concepts of gamification are especially useful in this context. Examples include the Treaty game developed by the Hul'qumi'num Treaty Group at University of Victoria (n.d.) and Democracy 2 (Positech Games, n.d.) This interactive policy game is being modified by Tovey at the University of Waterloo for use in policy simulation (Personal communication, September 30, 2012).

Finally, by making the system visible, it provides the opportunity to "point at stuff" – to go from a top-level overview to detail. (M. Tovey, personal communication, November 30, 2012). If designed effectively, the visualizations can change the metaphor from drill-down to pan-and-zoom (E. Tufte, personal communication, July 23, 2012). Edward Tufte, author of numerous books on data visualization, talks about the traditional drill-down model as being analogous to a Table of Contents where readers (users of the data) can flip to a page of interest. The challenge is that it is difficult for humans to remember the detail on the "page before" and keep in mind the overall context. By changing the metaphor to pan and zoom, it becomes easier for viewers of the visualization to spot anomalies or patterns and zoom in for more detail without losing sight of the relationship of the detail to the whole.

### *Basins of Attraction*

A useful framework for analyzing the current system state is the concept of basins of attraction. As defined by Walker et al., "a 'basin of attraction' is a region in state space in which the system tends to remain (2004). For systems that tend toward an equilibrium, the equilibrium state is defined as an 'attractor'…" In social innovation terms, a basin of attraction would represent the current state of a system regime. Westley et al. define a regime as "the dominant rule-sets supported by incumbent

social networks and organizations and embedded in dominant artefacts and prevailing infrastructures, of say, particular industries or social problem arenas." (2011). The following figure shows a graphical illustration of the model, in this case showing relationships between multiple variables and regimes in a three-dimensional view. In this three-dimensional framework the map is comparable to the effect of gravitational fields Einsteinian space (Walker, et al., 2004). Different basins exert force that can attract the system. This is critical when looking at how to move to a different, desired, system state. It may be difficult to get from "here to there" without dropping into an unwanted state due to its attractiveness and resilience.

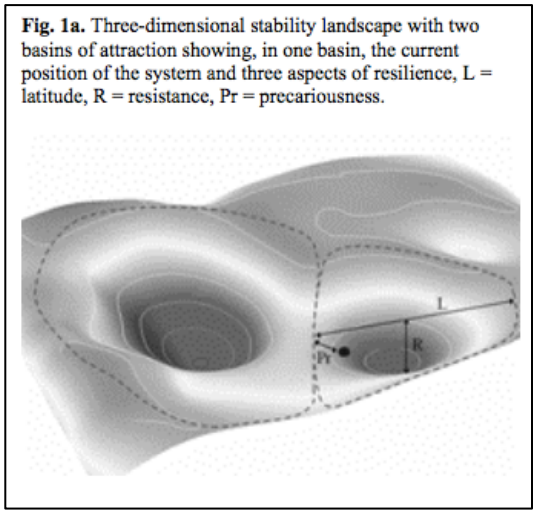



**Figure 2: Three-dimensional basin of Attraction Visualization. (Walker et al. 2004)**

### *Moving from one basin to the next*

The challenge for social or institutional entrepreneurs is how to take action that will shift the current system into a different basin of attraction. It is important to note that change is automatic as shown by thinkers as diverse as Karl Marx and Joseph Schumpeter (Cited by S. Quilley, personal communication, November 23, 2012) Systems will crash and change – the question is the degree to which human beings can become conscious collectively and guide the change (S. Quilley, personal communication, November 23, 2012). In Westley's words, "Where is the change you want to see?" (Personal communication, November 27, 2012). In effect this is asking the question of whether to work towards increasing or to reducing resilience? Increasing resilience equates to lowering the new basin – making the new system more attractive, more stable, more likely to "stick" given a system shock. Alternatively, one might take the approach of reducing the resilience of the current system – effectively raising the level of the old basin. The illustration below provides a graphical representation of these two alternatives. Note that the alternatives are not mutually exclusive. For the successful

translation of niche innovations to regime change (Smith 2007), a patchwork or bricolage (Gundry et al. 2011), of innovations are needed.

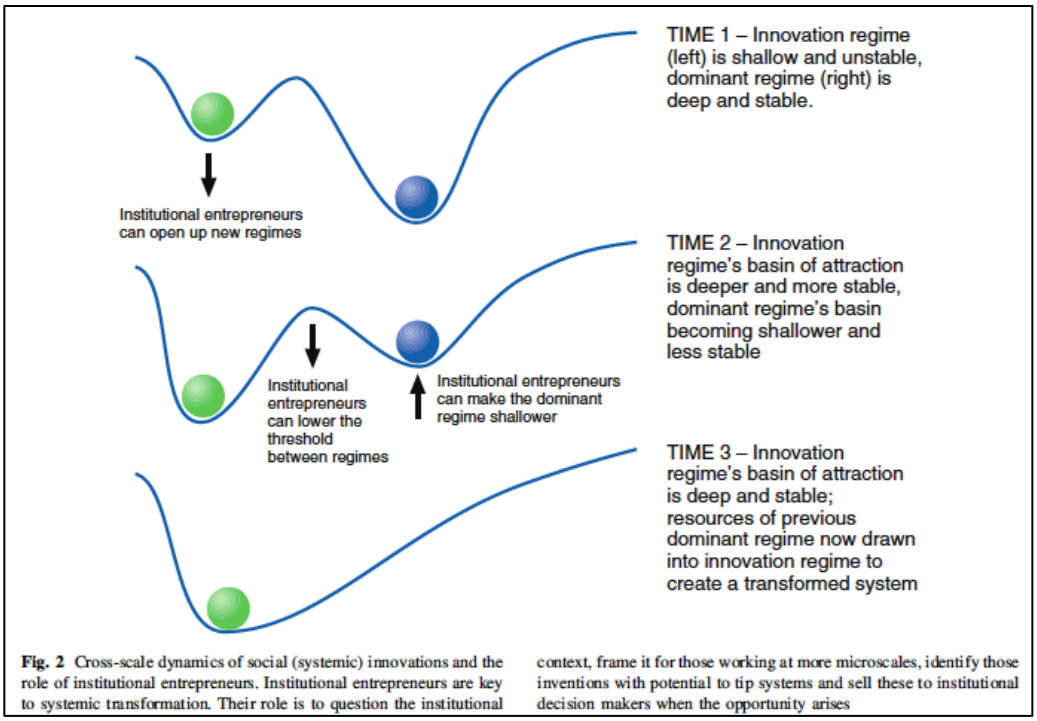



**Figure 3: Illustrating Regime Change with Basins of Attraction Model. (Westley et al. 2011)**

From a visualization standpoint, the basins of attraction model is very useful for gaining a common understanding of the current system state, alternative states and landscape variables that may impact regime translation. However, as a visual model, it is missing crucial detail. It does not adequately show the factors that both define the current system, and map the current landscape. It similarly does not exhibit the variables that might need to be affected in order to change the current state. For that we must turn to system mapping.

*Complex adaptive systems Maps*

Mapping complex adaptive systems visually is a powerful method of illustrating a system, gaining common agreement and starting to analyze possible changes. Maps can be simple or complex, static or interactive, broad or focused. All are useful at different points.

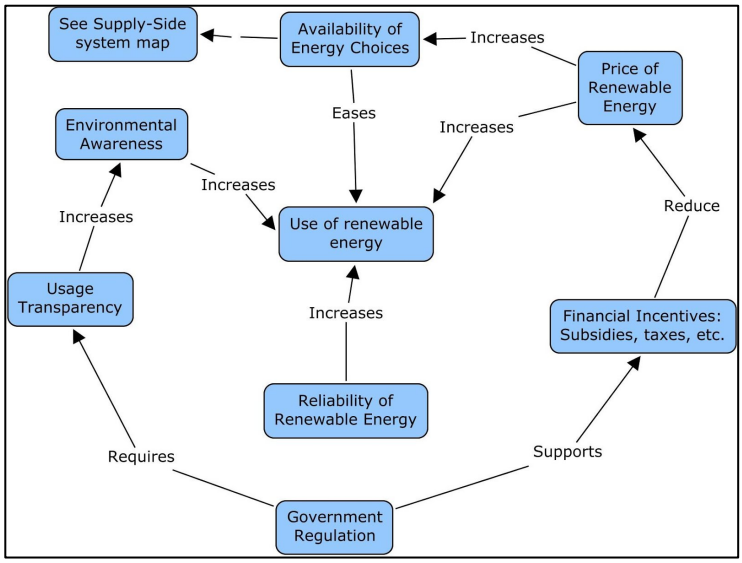



**Figure 4: Demand Side Energy System Map; (williams et al. 2012)**

In this simple example, we see a map of factors impacting demand for clean energy in Canada. One can “read” the map and identify relationships such as Government Regulation supports Financial Incentives. Those Financial Incentives reduce the Price of Renewable Energy that increases both the Availability of Energy Choices and the Use of Renewable Energy. Ideally, the map should use words to describe relationships. One must be able to "walk through" the map with the nouns and verbs mapped to variables and relationships. In a labs setting, participants can collaboratively build the system map and start to informally test by asking questions such as: Are there cases where Financial Incentives actually increase rather than reduce the Price of Renewable Energy? Are there factors that are missing from this map? Can we identify the quantitative relationships between these variables?

System maps can rapidly become extremely complex as shown by this map of the system impacting obesity in the UK, so it is necessary to use tools and techniques to isolate the relevant components.

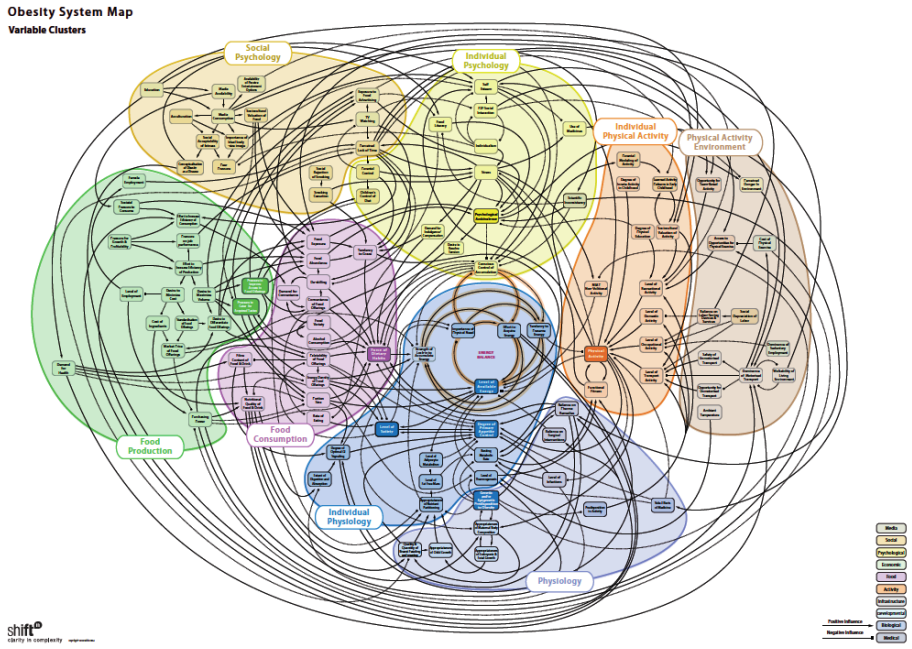



**Figure 5: Complex system map of obesity in the UK. (shiftn, 2006)**

However, one can also achieve a marriage of simplicity and complexity. The map below, from Sendzimr et al., is actually mapping multiple regimes on the same map. The dominant "Protect landscape from the River" regime is mapped alongside the innovation regime "Live with the River" (Sendzimir et al., 2007)

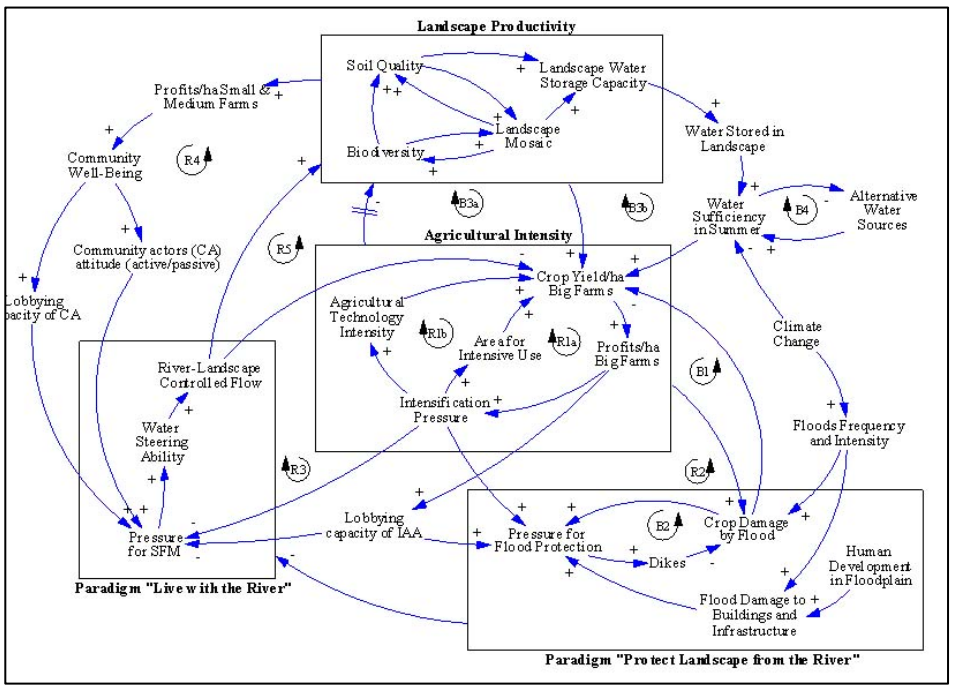



**Figure 6: Dominant and Innovation Regimes as System Map. (Sendzimir et al., 2007)**

From this map we can see that the dominant regime is deep and is connected to many strong institutions such as the agricultural lobby, water management bureaucrats and farmers. The innovation regime may have promise with some institutions but still needs deepening to make a viable alternative. We can use the map to test whether the system can move through influence or if it may still take a crisis to tip. And of course we must remember that unless the alternative is ready, the system may revert to the dominant regime. If integrated into a simulation tool, this type of system map could play a powerful role in helping participants understand how proposed actions or innovations might move the system in one direction versus another.

The figure below shows a simpler system. It illustrates how new tools are allowing increased interactivity with the system. This figure is showing the relationships of jobs in the traditional resource sector and how those might transition to the clean technology sector – often a promise of governments and environmental groups looking to a green jobs future. The map illustrates that the transition rate to new jobs is impacted by both availability of retraining funds and the availability of clean tech jobs. The model could be made more sophisticated by adding elements to model job readiness. We will return to an example with that level of complexity later. This model, created using an online tool called Insight Maker (http://www.insightmaker.com), allows Labs participants to change variables and run a simulation to see the impact over time on jobs, transition rates and, in this case, CO2 concentration levels. The tool allows for complex and nonlinear relationships to be modeled. Tools such as Insight Maker, Vensim and Stella provide a bridge from the first phase of decision making – gaining a common understanding of the system – to the second – exploring alternatives.

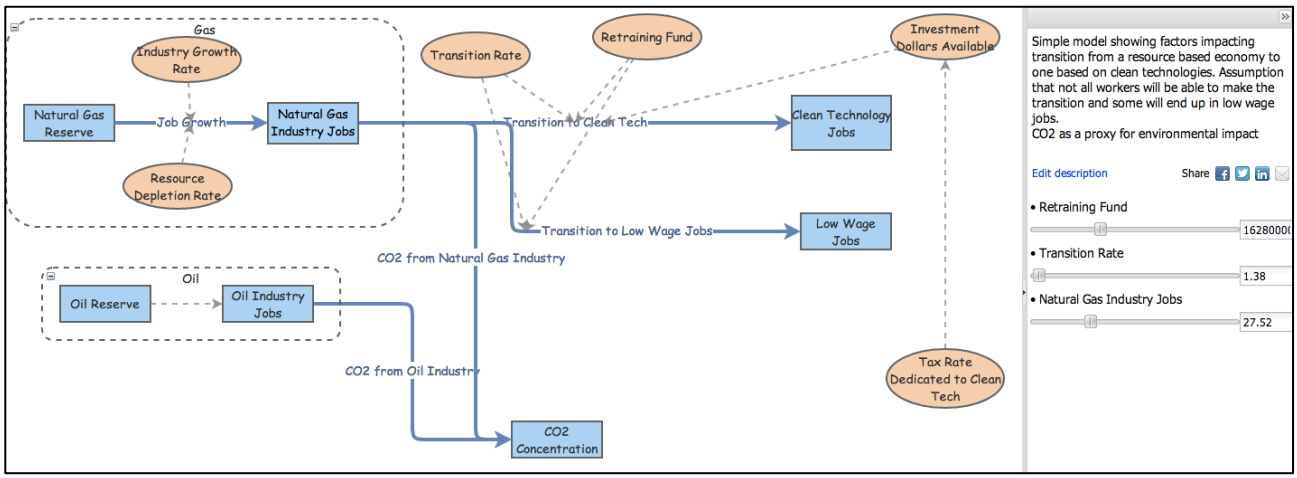


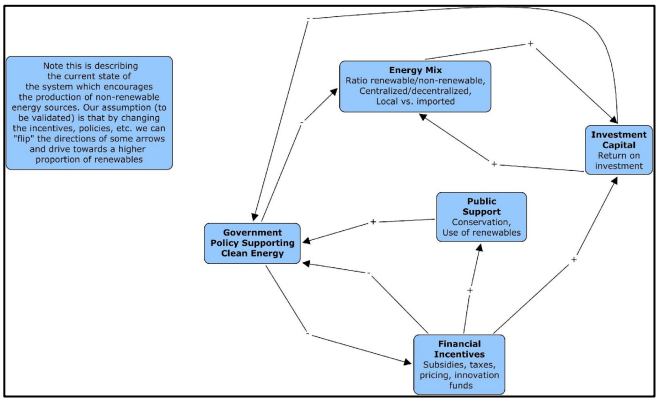

**Figure 7: Clean Technology Job Transition Model. (Williams, 2012)**

### *Linking Basins of Attraction with Complex Adaptive System Mapping*

A key concept when looking at basins of attraction is that resilience is not a "good" per se. If we link the basins concept to Holling's adaptive cycle (cited in Westley et al., 2006), we can ask questions such as: Are we looking at where an existing system is brittle, in rigidity trap? Are there factors that may be keeping a system in a deep basin or could there be an opportunity for change?

Just as important to consider when reducing the resilience of the old system how we are building the resilience of the innovative alternative. The example of Egypt and the Arab Spring provides a chilling example of what can happen if the alternative is not sufficiently resilient. After the energy of the Arab Spring and the removal of President Mubarak, there was much hope for a new regime – a new model of democracy in Egypt. When the new President, under the influence of the Army, proposed changes to the constitution that would provide him personal immunity from prosecution and enshrined military presence in the government, this seemed to dash the recent hopes. (Westley, Personal Communication, November 27, 2012) Through the lens of the Basins of Attraction theory, we can see that without a suitably resilient alternative, the system simply reverted back to its old state. Holling notes that systems can exhibit very strong qualities of *rememberance* and revert to earlier states as a matter of course. (cited in Westley et al., 2006)

As an example, our project is focused on how to move Canada towards a low-carbon economy while protecting and enhancing Canadians' prosperity. Our current and desired energy systems can be represented within the basins of attraction model. Our current high-carbon system has substantial lock-in and is at the base of a deep and stable attractor. The current economic, financial, social, cultural and political landscapes reinforce this system and make it very resilient. This system can be described with the system maps below. These system maps illustrates the constraints, or barriers (Smith, 2007) to changes to the current regime.



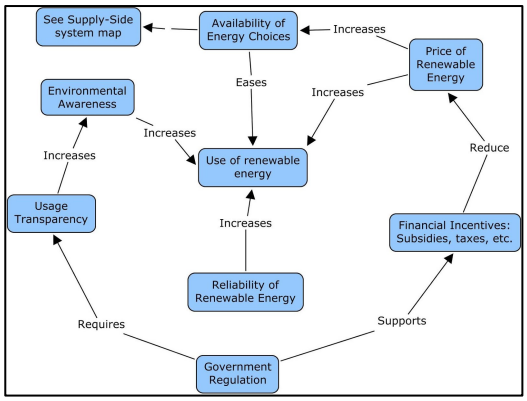




**Figure 8: Supply Side Energy System Map. Williams et al. 2012**

**Figure 9: Demand Side Energy System Map. Williams et al. 2012**

In contrast, the desired system, a low-carbon economy that preserves and enhances Canadians' wellbeing and prosperity, is represented by the shallow and unstable attractor. Within the current context, it will be extremely difficult for the system to shift to a new basin of attraction.

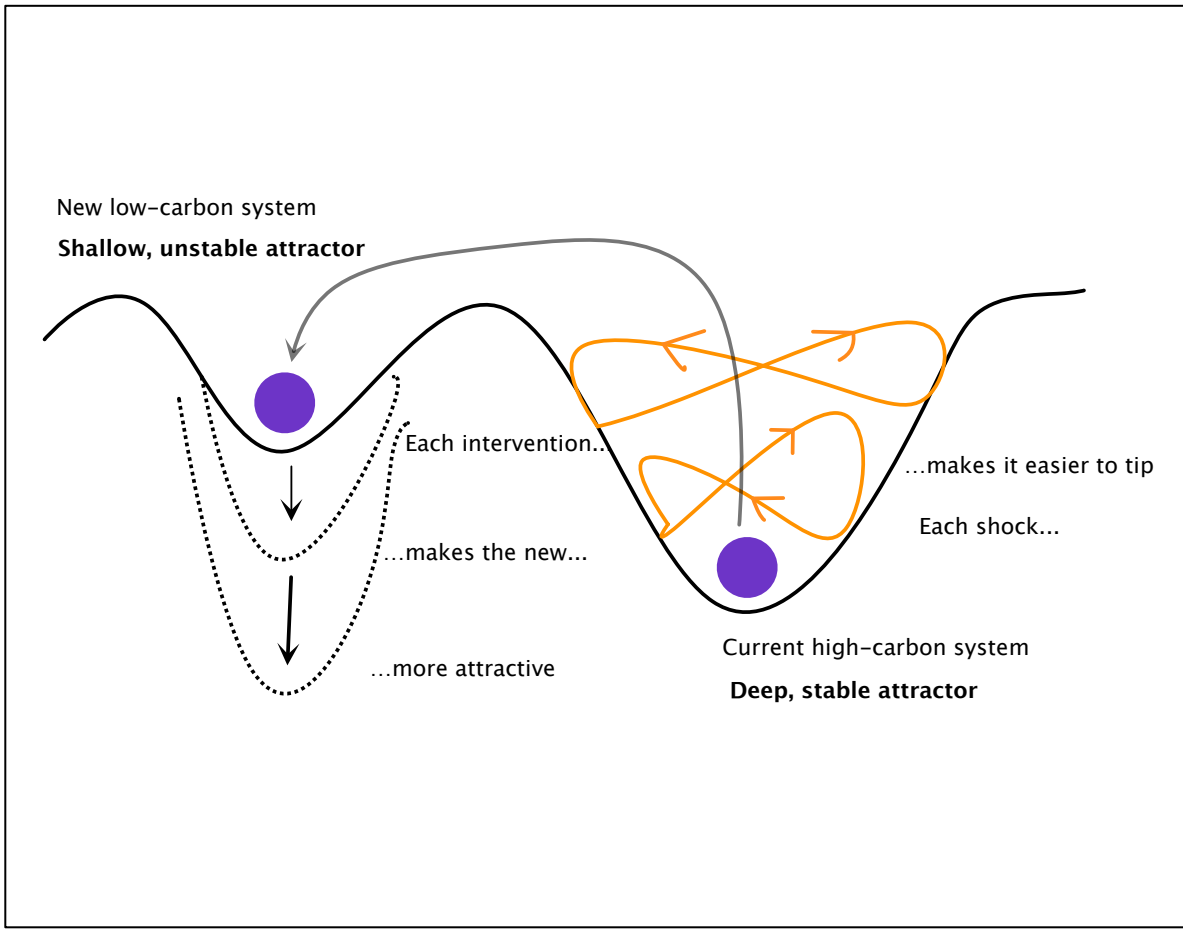



**Figure 10:Mapping Regime Change in Canada's Energy Systems. Williams, et al. 2012**

Our strategy envisions two main approaches to system change at this level. The first is to take advantage of system shocks when they occur. We foresee shocks in the near term such as: refs

- The United States becoming energy self-sufficient and ceasing to purchase energy from Canada (Mackey, 2012)
- A dramatic decline in supply and rapidly increasing prices for fuel, energy (and commodities such as food and plastics) (Arezki & Bruckner, 2010)
- National elections with energy as a key issue (Harrison, 2012)
- Citizen protests over pipeline development heading West to the Pacific or South to the US (CBC News, 2012)
- A large spill from a tanker running aground or ruptured pipeline (McGregor, 2012)

These shocks can be viewed as successive adaptive cycles. As the current system is very resilient, it is likely that each shock could be managed and resources would not be fully released. The system can exhibit the quality of *remeberance* and return to the previous state. However, with each shock, the level of the basin raises, making it more likely each time that the system can tip into the adjacent basin of attraction. Will that tip be sustainable and long term or will the system snap back to the dominant

regime, the phenomenon of *remeberance*? That very much depends on how well the alternative system is developed.

Utilizing the basins of attraction model, one can map different system interventions as having the impact of increasing the depth of the basin representing the innovation regime. As this happens, it becomes more likely that the tipping point will lead to long-term change. In our system, examples of interventions include:

- Carbon tax
- Social impact bonds
- A National Citizens Energy Strategy
- District energy systems

The effect of each intervention taken singly will not be enough to change the whole system; one must look to a portfolio approach to system change (Evans, personal communication, November 26, 2012). However, each innovation makes the new regime more attractive and increases the potential for adoption. This was a key piece that was missing after the financial crisis of 2008. Many people thought this would be an opportunity for alternative financial models to rise to dominance. Ideas such as cooperatives, credit unions and local economies were mooted but the system in fact snapped immediately back to the same dominant regime. One could argue that this was because innovations had not done a sufficient job of deepening the basin of attraction for the new regime; therefore it was not seen as a valid alternative to the dominant.

## *New Models*

What is not yet available is a visualization tool that would integrate these models. One could imagine a three dimensional basins of attraction model that was dynamically linked to an interactive system map. As participants in a lab changed variables and modeled system interventions in the system map, the basins model would update, the levels rising and falling. At a certain point, the system would "tip" to a new regime. The visualization could even simulate the level of resilience in the alternative system. Visually, the system would either "drop" into the new resilient system or, through rememberance, "bounce" back into the old regime. For example, one could reference polling data, real time prediction markets, or pre-built analysis to identify algorithms that would determine how the basins rise or fall based on system interventions. Software (referenced above) exists to model these types of simulations *within* systems, what is required is software that would model the relationships *between* systems.

The model could reflect more complexity by recognizing that there are rarely only two alternatives. For example, looking at Canada's health care system, many people would agree that we have serious challenges maintaining funding and service levels as the system is currently designed. Yet there is a deep and immediate reaction to proposed changes in large segments of the population. This

may be an intuitive sense that as a regime starts to change, there is a risk that the system will fall, not into the desired alternative, but the "next adjacent" system (a system that is not perceived as desirable). In this example, the "next adjacent" system might be that of the United States. An interactive visual model of the system state changes linked to the basins of attraction model would provide a useful framework for addressing and discussing this concern in a Labs setting.

### *Theories of Behavour change and Simulation as prefigurative action*

Much of the concept behind data visualization and simulation is based the premise that more information will drive behaviour change. Weber argues that may be a simplistic approach that disregards recent research in social psychology. Weber argues that when changing behaviour attitudes don't matter but align to match behaviour. In fact, Weber posits that "most social behaviour is pattern matching" (Forgas cited by M. Weber, personal communication, November 24, 2012) and, citing March (1994) that decision making is most often based on situational rules (M. Weber, personal communication, November 24, 2012). However, Hilary Kilgour argues that behaviour doesn't matter; beliefs do. What people value - time, hope, etc. do impact behaviour. We ask think of these as "currency" and ask how do other technologies help use these currencies better? (H. Kilgour, personal communication, November 25, 2012)

Does this mean that presenting information in a Social Innovation Labs context will not help drive behaviour change? Perhaps not if simulation is looked at as modeling *prefigurative* action. Quilley argues that these types of actions "experimentation - knowledge, mini-institutions" can be useful (S. Quilley, personal communication, November 23, 2012). The actions chip away at boundaries between basins of attraction and smooth the path when windows of opportunity open up (i.e. through system shocks) that can then cascade disruptive innovations into the new regime. One could imagine that simulations, even the structure and design of the Labs themselves, are in essence a practice for the behaviour change required in the "real" world. This gives participants a visceral sense of what a different system looks like, what it feels like and thereby making it more likely that behaviour change will be replicated when leaving the labs. What is happening here, and in open-participant driven events such as Vancouver Changecamp, is that we are modeling a new way of behaving. In the example of Changecamps, agendas are developed collaboratively, knowledge hierarchies are broken down and respect for divergent opinions is encouraged. Rather than just educating or describing new behaviours, this is actually changing behaviour first which, per Weber, can then lead to attitude change and lasting behaviour change.

Gamification, referenced above, takes this concept to the next level where behaviours "in the game" may have real world impact and consequences. Examples include World Without Oil, collaborative game imagining first 32 weeks of a global oil crisis and Urgent Evoke. EVOKE was a "ten-week crash course in changing the world…free to play and open to anyone, anywhere". The goal of the social network game is to help empower people all over the world to come up with creative solutions

to our most urgent social problems. These games can be very large scale as with Superstruct. - Superstruct was a massively multiplayer forecasting game, created by the Institute for the Future, and played by more than 8000 “citizen future-forecasters from September - November 2008 “(Cited in McGonigal, 2011). In the consumer realm, Nike have been using game mechanics to encourage personal fitness through their Fuelband platform. It remains to be seen how much this can translate to behaviours that would have an impact at the meso or macro system scale. Early efforts are promising and warrant further study.

## *Challenges*

I wish to raise three challenges to the concept of Social Innovation and propose solutions. The challenges are access – who participates in Social Innovation Labs, the need for a new portfolio of data visualization and simulation tools, and the limits of reason – the challenges of taking a data driven approach to change.

### *Limits to Access*

Early focus on Social Innovation Labs, as proposed and as seen in practice around the world has had a concentration on engaging policy makers. Policy makers are certainly part of the equation but remain a necessary but not sufficient condition for social innovation. Bason describes a Social Innovation Change Lab that holds much promise for social innovation in Canada (C. Bason, personal communication, 2011). A serious challenge to this model is the lack of readiness for this in many facets of the public sector in Canada. Government officials (and private and non-profit sector leaders for that matter) often want research or analysis to confirm and support existing goals rather than go in a different direction. That can be a very scary and challenging outcome for managers (M. Quayle, personal communication, December, xx, 2012)

We have tried to address this in Vancouver with Changecamps. These are one-day events bringing together members of the public, elected officials, public sector staff, non-profits, business community members and activists in an unconference style model. In this model, the agenda and content is driven by the participants not the organizers. The day is framed around answering the questions: "How do we help government become more open and responsive to citizens?" and "How do we, as citizens, self-organize to achieve our own objectives?" (Vanchangecamp, n.d.) The intent is to provide a safe space where those "powerful strangers" can meet and start to form the shadow networks alluded to in Westley et. al. (2011).

We are now planning the next change camp and as an overall theme have the goal of building and supporting a community of engaged citizens. By providing space for conversation across organizational and institutional boundaries, modeling a democratic organizing framework for the day,

and building in ongoing support for project that emerge from the event, we are starting the lay the groundwork for broad systemic change - even if we don't know what that looks like prior to the event. Note that this capacity is built both inside the different groups and across the groups. For example, staff from the City of Vancouver had attended previous Changecamps and based on that positive experience, contracted a company founded by Changecamp organizers to design and facilitate "Greenest City Camp" - an open innovation event engaging citizens in co-creating solutions to make Vancouver the Greenest City. Going forward, we are hoping to build more infrastructure around Changecamps, perhaps partnering with an existing "lab" such as the new Accelerator program within ISIS at the University of British Columbia or the proposed Civic Renewal Lab at Simon Fraser University. Universities can be an ideal place for this type of innovation can take place.

Having said that, there is innovation taking place at the grassroots or niche level across Canada and in many cases is taking the lead in advance of the existing regime. Social Innovation Labs, or at least the “clients” engaged by the Solutions Lab at MaRS, seem to focus on engaging actors that are embedded into the dominant regime. This limitation is not set in place by the Social Innovation Labs concept, however if enough early Labs take this approach for practical reasons (i.e. public funding is available) this runs the risk of setting a practical precedent that no amount of theory can overturn. Note that exceptions exist such as the recent Solutions Lab prototype in Sudbury where conversations took place with academics and people with a mining background with no policy makers in the room (M. Tovey, personal communication, January 22, 2012).

Even if a best attempt at a “whole system” is made, the limited space and time available will inevitably limit the range of voices represented. Is it possible to come to legitimate decisions with such a limited subset of innovations represented? How do policy makers enter those spaces? A potential solution is to bring labs structure and technique to the grassroots communities; not existing in a separate laboratory but getting the experts to enter into communities and innovation clusters that already exist. With this approach one might strengthen the thinking of social innovators at the niche level. This goes beyond building capacity but giving people the capacity to link their work to systemic impact. (C. McCormick, personal communication, January 7, 2012). Visualization through system mapping can play a strong role here and act as a bridge to link disparate innovators into, at the very least, sharing a common understanding of the system they are trying to change. The Knight Foundation has published a paper on technology for engagement and surveys a wide range of tools available that can break down the walls of Labs (2012).

Finally, it might be helpful to think of a Lab as not an event but a part of a process. In microcosm, the Lab will map the design process of ideation (divergence) followed by convergence in an iterative repeating pattern. At a larger scale this would be reflected in a series of events (with the same participants or varying). This could also include a portfolio of engagement options of which Labs is only one.

Westley et al.(2012) raise the question of whether a Design/Change lab is best to be place-based or virtual. While the virtual approach has much to commend it in providing more open access, it raises additional challenges by limiting participation to those with access to the required technology as well as favouring those with learning styles conducive to virtual communication and participation. Another challenge (one that could potentially be managed with careful facilitation design) is managing different learning styles in the room. For example, some individuals are able to respond right away to new ideas and contribute immediately. (B. Zimmerman, personal communication, September 29, 2012). Others need time to process, deliberate then make comments and contributions. If the Labs process is not designed carefully, the time pressures will exclude part of the group.

## *A Portfolio Approach to Data Tools*

Given the complexity of systems that need to be part of the Social Innovation Labs process, it will be extremely difficult to have a single tool that will meet all needs. What is required is a portfolio approach of tools, processes, and alternatives. The model below gives a simple overview of some current tools available mapped by stages in the decision making framework. Note that with further research, the model below could be extended to include additional dimensions of audience type (e.g. policy maker, general public, etc.), type of decision map out the sequencing, usefulness based on audience, stage, type of decision and lab location (physical vs. virtual) and sequencing (i.e. where in the continuum of engagement the decision lies)

| | Understand | Explore | Choose |
|---|---|---|---|
| **Goal** | Gain common understanding of system | Discover alternatives | Decide on preferred alternative |
| **Concepts** | System Maps<br>Basin of Attraction<br>Infographics | Innovation translation | Cost Benefit Analysis<br>Portfolio visualization |
| **Tools** | Vensim, Stella, Insight Maker, Business Model Canvas, Tangle, Microsoft Research | Insight Maker, Vensim, Crystal Dashboard, Tableau, Democracy 2, Big data analysis – SAP, Oracle, IBM, etc. | Crystal Dashboard, Tableau |

**Figure 11:Preliminary taxonomy of visualization and simulation tools by decision stage**

As Social Innovation Labs evolve, there will be a need for both new tools and a method for integrating the disparate set of tools mentioned above. Ideally, these solutions will be developed as open source tools to maximize the potential for use. However, some tools might be very complex to develop. A recommendation is to form a consortium of actors involved in the Social Innovation Labs space to collaboratively develop software tools for common use. This approach would provide distribution of cost, intellectual capital and project risk.

There are existing institutions already looking at data visualization for social policy that would be good candidates for such a consortium. For example, the BC Hydro Interactive Theatre at UBC is an example of a purpose built space for collaborating around, and interacting with, big data (CIRS, n.d.). Big data refers to the massively large volumes of data generated from medical research, Internet message and search traffic and corporate databases. Advances in processing power and database analysis tools allow for interaction and exploration that was not possible even a few years ago. The Theatre includes high-power servers, high-definition projectors allowing for a 360 immersive view of data, interactive touch screens and flexible, easily reconfigurable space design. Clients of the Theatre have included the City of Delta looking at impact of climate change driven sea level changes and City of Vancouver planners looking at policy impacts on neighbourhoods. This integration of data, users and decision makers could be a model for Labs in the public sector.

Going forward, there are a number of areas where further research on data visualization development would be useful. The first area of investigation is how to find patterns and relationships that are meaningful in big data. For example, Google has released an influenza tracking tool that accurately predicts flu outbreaks by tracking the incidence of search terms related to flu symptoms (Google, n.d.). This works because of the huge volume of data processed by the Google servers. With other data sets, the challenge is how to find the valuable information hidden. This is more than just searching but getting help in understanding how variables might be related in statistically significant ways or in finding patterns that can be leveraged to test a given hypothesis.

The second is bridging the worlds of data exploration and presentation into a single tool. Typically data tools are built for either producers or consumers of data visualization. In line with the rise of the prosumer in other areas of maker culture (S. Quilley, personal communication, November 23, 2012), we see the same process with data analysis. End users have a goal when looking at data where that is demonstrating the validity of a theory, getting a raise or gaining approval for a project. Tools that combine exploration and meaning-making with this communication and story-telling function are needed.

Finally, tools are needed that allow Labs participants to simply interact with a system simulation. This interaction must not be limited to changing system variables, but also relationships, linkages and connections in a way that participants can easily understand. Building a tool (or set of tools) that combines the rich complexity of adaptive systems with a simple, easily understandable

interface is a daunting design challenge but one that needs to be solved if data visualization and simulation are to reach their full potential in Social Innovation Labs.

## *The Limits of Reason*

Quilley raises a number of issues that would seem to question the value of data-based decision making in a Social Innovation Labs setting. Admittedly, data visualization and simulation is only a component of the Social Innovation Labs process. However, underlying the Labs concept as proposed, there is a fundamental belief that if we just get the right people in the room -- if they can just understand -- they will come together around solutions and make change happen. As Quilley points out, despite 20 years of climate change data and 40 years of the idea 'limits to growth' per capita consumption keeps going up, why? He argues that this is partly due to structural interlocking interdependence -- consumption is very rooted and hard to shift, partly a collective action (or free-rider) problem, and partly geo-political whereby a policy of degrowth (for example) would cause internal instability. Underlying this is a faulty understanding of social action and motivation based on an "enlightenment commitment to the rational individual, a cognitivist bias towards data and information in decision making and a deep-seated suspicion of 'irrational' drivers of behaviour "(personal communication, November, 23, 2012). If this is true, and if, as Weber (cited earlier) is correct that behaviour change precedes (rather than is driven by) attitude change, then will the experience of a Social Innovation Lab actually lead to real change?

Perhaps the outcome of a Social Innovation Lab is where the change can happen. However, this assumes that participants can imagine a different world, one that is very different from our own, envision possibilities to change and then persuade others that are also embedded in the dominant regime to participate in that change. As McCormick points out, "…the forum and tools [can be] used to help reinforce more of what people think they know…the data is always flawed in some way, shape or form" (C. McCormick, personal communication, January 7, 2013). This is also a limitation of the tools used for visualization and simulation. As discussed earlier when referencing parametric modeling, models have human designers with limited knowledge and will always have inherent limits and imperfections. The biggest of these is that they are *designed inside the current system* with all of the conceptual limitations that implies. Social Innovation Labs must be designed in a way that recognizes these limitations and utilizes concepts of social psychology to ensure that ideas and concepts are framed in a way that can be integrated by participants and those outside the labs that need to participate in change.

An example of this is the "empathy altruism hypothesis" (Batson, cited by M. Weber, personal communication, November 24, 2012) which attempts to answer the question what could motivate altruistic action? Batson's overarching lesson is that the only thing that motivates this is human empathy. In the example of the system changes required to mitigate the issues of climate change, an

approach might be to frame this issue as "taking from our children" For example rather than criticising rural homeowners for excessive CO2 emissions, one might talk about how hunting is a family tradition - one that might not continue to the next generation if climate change impacts wildlife habitats.

Finally, it must be remembered that Social Innovation Labs are an experience. In many ways they are themselves a prototype of system change. Taking a phrase from design thinking, the experience, the simulation and the x…. represent the process of "making hope visible" (Collins cited by E. Jernigan, personal communication, November 25, 2012)

## *Conclusion*

In conclusion, there is tremendous promise for the use of data visualization and simulation in supporting Social Innovation Labs. However there are some key areas to address to make the visualization, and the Labs themselves, more effective. We must take great care to ensure that access to the Labs is not limited – that those who are part of the system and those who would be affected by the proposed innovations are part of the discussion. We must continue to research and develop alternative tools that can fully represent the complexity of adaptive systems while maintaining simplicity of interface. Finally, we must be ever mindful of the limits of data and reason in decision making. The context of the Labs, the composition of the participants and the designed experience are all key components in ensuring that the Labs will have the desired result – changing the world for the better.

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