Dynamics of Innovation Implementation in Social Service Organizations

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Abstract

Successful implementation of innovations is central to social service organizations' effectiveness and improvement of services to clients. Yet administrators face a host of challenges and implementation failures are common. This paper discusses the nature of the innovation implementation as inherently dynamic, endogenous to the organization, and constrained by conditions of bounded rationality. Several system dynamics models of innovation implementation are reviewed from manufacturing, health, and human services in terms of their appropriateness and evidence base for social services. Recommendations for practice and a research agenda offered.

Keywords: innovation, implementation, social services, system dynamics

1. Introduction

Current discussions of the barriers to using evidence based practice in social services are drawing attention to the more general problem of innovation implementation (Proctor, 2004). While the diffusion literature focuses on decisions to adopt an innovation, implementation research looks at how new practices get implemented following the decision to adopt (Klein and Knight, 2005). At least since the work of Zaltman, Duncan, and Holbek (1973), scholars have pointed to the great difficulty that organizations have with successfully implementing new practices. Studies of implementation are critical because organizational effectiveness typically entails the ability to successfully implement new ideas (Aiken and Hage, 1970; Argyris and Schön, 1978; Borins, 2002).

Social service organizations are constantly under pressure to change. The needs of clients and demands for services change with social conditions, availability and accessibility of services, and individual client histories. Organizational environments change with federal and state policies, social attitudes, political climate, professional standards, funding streams, availability of trained professionals, competitors, and the knowledge base. Organizations also face internal pressures to change from staff turnover, new management, information systems, budgets, outcome evaluations, and reorientation of strategic goals. Such pressures motivate organizations to find, develop and implement new ideas. Initiatives to improve the quality of services typically involve all three of these domains: client needs, the environment, and internal organizational processes.

Recent efforts to improve the quality of social services have focused on the implementation of evidence based practice (EBP). EBP is broadly defined as the "conscientious, explicit, and judicious use of current best evidence in making decisions about care of individual patients" (Sackett et al., 1996). EBP is a system for making clinical decisions aimed at improving the quality of services by maximizing the use of scientifically supported interventions. The term has now spread to nursing, teaching, and social work, along with controversy that parallels a drift from its original formulation (Jonson-Reid et al., under review). Despite its promise, implementation of EBP remains a challenging problem with a call for more studies addressing organizational barriers (Bartels et al., 2002; Rosen, 1994; Hoagwood et al., 2001; Newman, Papdopoulous, and Sigsworth, 1998; Rosenheck, 2001; Schoenwald and Hoagwood, 2001).

Addressing barriers to implementing EBP involves understanding the implementation process as a social phenomenon that is inherently dynamic, endogenous, and constrained by conditions of bounded rationality. It is dynamic because the focus is on change over time, endogenous because the process is largely internal to the organization where success builds on itself and resistance to change is a long-recognized barrier to implementation (Coch and French, 1948), and constrained by conditions of bounded rationality (Kahneman, 2003; Simon, 1979). That is, implementation of EBP as a social phenomenon is dominated by and therefore best understood in terms of dynamic complexity.

The primary goal the paper is to characterize the implications of this dynamic complexity on knowledge development for implementing EBP. The paper is organized as follows. Section 2 describes the epistemological challenge facing organizational and implementation researchers, and argues for the construction of models of the causal mechanisms underlying implementation. Section 3 takes up this approach by reviewing several existing models of organizational change and innovation implementation. And, Section **Error! Reference source not found.** proposes a research agenda for advancing the study of implementing EBP.

2. A plea for causal mechanisms in implementation research

We are, in one sense, intimately familiar with the factors contributing to implementation failures within organizations. Most people can, for example, point to soaring costs and inadequate budgets, not enough time, high caseloads, employees resisting change, lack luster performance of managers overseeing the implementation, overly optimistic timelines, disruption of services, changes in organizational environments, and bad ideas that should never have been adopted in the first place as reasons for why something did not get implemented. The tendency is to attempt to fix these factors by increasing budgets, motivating employees, putting more

competent managers in charge, investing more time in planning, or setting more realistic timelines. Yet this focus on fixing particular factors associated with implementation failure is flawed and inherently misleading because it does not recognize the dynamic interdependencies that govern the implementation process.

Knowledge of factors contributing to implementation failures or barriers to implementing EBP is largely based on a set of associations between purported causes and their effects, and therefore essentially descriptive in nature. For example, most studies of the diffusion and implementation of evidence based practice refer to factors that increase or decrease adoption or implementation, but stop short of specifying the causal mechanisms driving change (Hovmand, Perron, and Proctor, 2005). Those that do mention causal mechanisms tend to either be qualitative studies or conceptual papers. The lack of well-specified causal mechanisms in implementation research parallels the general absence of causal mechanisms in other discourses such as empirically supported psychological treatments (Wampold, 2006; Jensen et al., 2005), social theory (Hedström and Swedberg, 1998), and evaluation research (Brickmayer and Weiss, 2000).

One reason for the dearth of causal explanations is the dilemma that social scientists face when studying organizations as complex systems within unique environments. Attempts to develop rigorous universal models come at the price of relevance to the administrator. Schön (1983) sees this as the dilemma of rigor versus relevance when scientists seek to develop generalizable knowledge in the tradition of the hard sciences. Instead, recognizing that organizations are uniquely situated within complex and changing environments, Schön argues for organizational case studies of prototypical causal patterns or stories. Prototypical causal patterns are explanations of *how* the outcomes were achieved. These explanations emphasize general features of the situation. Such causal stories are not generalizable knowledge in the sense of giving decision makers universal facts about how one might implement an innovation. Instead, Schön argues that prototypical causal patterns facilitate what cognitive psychologists refer to as analogical transfer.

Analogical transfer refers to the application of a solution from one problem to another problem and is associated with expertise (Novick, 1988; Novick and Hmelo, 1994; Reeves and Weisberg, 1994). Transfer occurs when a decision maker recognizes surface or structural similarities between the current problem and a previously solved problem. Novices tend to only see surface similarities and mimic the solution procedure, while experts are more likely to see structural similarities between problems with dissimilar surface characteristics and adapt previous procedures to the current problem. But analogical transfer can either help or hinder problem solving. When salient features are recognized, positive transfer helps decision makers find solutions. Negative transfer is also possible. For example, identifying false or irrelevant similarities – surface or structural – can lead to the wrong strategy for solving the problem. An emphasis on understanding prototypical causal patterns is motivated by a desire to enable positive analogical transfers. In the case of implementation research, the type of expertise sought is an ability to recognize structural similarities in the implementation of innovations across organizations that differ in their surface characteristics.

Recognizing structural similarities entails being able to compare two or more representations or mental models of a process. A mental model is a representation of knowledge about some problem or system that can be manipulated to find a solution (Johnson-Laird, 1983). For example, in searching for a solution to the problem of implementing evidence based

practices, an administrator draws on an abstraction of the organization that can be used to anticipate the consequences of various actions, and thereby performs a mental simulation of the organization during the implementation process. Mental models are necessarily simplified and incomplete, but they also tend to be fuzzy and systematically exclude features leading to misperceptions of a problem structure and errors in judgement, especially in dynamically complex environments (e.g., Sterman, 1989, 1989; Moxnes, 2000; Funke, 1991; Brehmer, 1992). Mental models have therefore long been the targets of interventions where improving the mental models will lead to better decision making (Axelrod, 1976; Forrester, 1971).

Inferring structural similarities across a set of diverse cases implies a generic structure. A generic structure is a mental model that represents a structural similarity across a diverse range of cases. Being able to identify generic structures thus helps decision makers with analogical transfer and problem solving. We believe that what distinguishes the expert from the novice is his or her stock of generic structures. Lane (1998) has considered the nature of generic structures more formally by classifying them into counter-intuitive archetypes, abstracted micro-structures, and canonical situation models.

Counter-intuitive archetypes refer to qualitative descriptions of causal maps and dynamics, which are usually accompanied by some type of management principle. Archetypes are essentially metaphors that facilitate analogical transfer by helping practitioners recognize a deeper structure and apply the management principle. The difficulty with such archetypes is their ambiguity. Archetypes are open to different interpretations and hence different management principles. Moreover, there is heavy reliance on the use of human cognition to draw valid inferences from such qualitative representations. This is problematic given the nature of mental models—if we could simulate mental models, then we would not need a method of refining them.

Abstracted micro-structures represent a different type of generic structure, typically used as parts in creating more elaborate structures. Micro-structures generate a particular pattern of behavior such as exponential growth, decline, or oscillation. While they help us recognize an abstracted structure underlying a particular behavior pattern, they do not necessarily help us understand the importance of a given micro-structure relative to the others in a particular model. Micro-structures are generally too limited to represent the entire mental model of a particular situation.

Canonical situation models hold promise for facilitating analogical transfer. Lane's (1998) canonical situation models comes closest to Schön's (1995) prototypical causal patterns. Like prototypical causal patterns, canonical situation models represent patterns such as commodity production cycles, high staff turnover, declining service quality despite investments in Total Quality Management, and implementation of innovations. For Lane, however, canonical situation models are more formal mathematical models of causal mechanisms.

What distinguishes a canonical situation model from other formal models is having passed a family resemblance test. That is, canonical situation models are empirically supported claims about an underlying structural similarity across a variety cases. What makes a model a canonical situation model is its passing the family resemblance test (Lane, 2006). As fully specified mathematical models, canonical situation models provide a means to test a set of hypotheses about the relationship between model structure and behavior. This allows one to both refine his or her understanding of the model through the use of mathematical analysis and to test

relationships with a wide range of data. The development of such mathematical models provides a means to accumulate knowledge in way that will maximize the utility to administrators in social services as they face a series of innovation implementations with evidence based practice.

System dynamics is in a prime position to contribute to this development. Pioneered by Forrester (1961; Forrester, 1968, 1969, 1971) at the Massachusetts Institute of Technology and with origins in control systems theory from electrical engineering, system dynamics is a way to solve problems by understanding how a set of causal feedback mechanisms or feedback loops interact over time to generate the dynamic behaviors of a system. One of the main advantages of system dynamics is that it provides a method for developing more precise theories of dynamic behavior. People often make statements that are so vague and superficial they cannot be proved wrong. Of course, making precise statements removes ambiguity and opens the possibility of being wrong. In one sense, any mathematical approach to specifying social theories does this.

What distinguishes system dynamics from other mathematical approaches to model building is a set of rules for formulating variables and the relationships between them that enforces a discipline, rigor, and thereby encourages one to develop theories that are internally consistent in their logic and tested against data. The point of this is not to be right in the sense of fitting the data, but to have more precise statements that can be communicated and facilitate learning. This is very much in the spirit of Meehl (1990), where theory becomes more refined through more precise formulations of causal relationships. Lane makes a similar point when stressing the opportunities for system dynamics in the agency/structure debate, “This part of social theory is crying out for a formal yet rich approach to theory building that will allow connection with empirical data and the elaboration of theories which results in the accumulation of well-grounded insights” (2001, p. 301). The next section takes up this idea by reviewing existing system dynamics models of organizational change as potential contributions to theories for implementing EBP.

3. Model related to implementation of EBP

There are four models from system dynamics literature that are especially relevant to understanding the dynamics around implementation of evidence based practice: Levin and Roberts’ (1976) general model of human treatment dropout, Samuel and Jacobsen’s (1997) model of planned organizational change, Sastry’s model of punctuated organizational change (1997), and Repenning’s (2002) model of innovation implementation. All four focus on organizations as the unit of analysis. These models were selected because they reflected some aspect of the implementation problem for evidence based practice in a social service agency, used system dynamics, were published in a book or journal article, and cited in the literature.

Although all of the models exist in some form as running simulation models, their general presentation varies from unsigned causal loop diagrams to stock-and-flow representations. Presenting one model alone would require simplifying the structure, let alone four models. So we have chosen to represent overviews of the model in the form of causal-loop diagrams with polarities assigned to the links and named feedback loops. For some models, this means that the direction of influence and loop polarities have been worked out from analysis of the model, while in other cases mechanisms have been named according to descriptions in the source text. Although this facilitates a comparison of the models with respect to the problem of implementing evidence based practice, some caution is in order. First, as has been well-noted in the literature, causal loop diagrams are often misleading in terms of being able to draw accurate

inferences about dynamic behavior, and hence the need for simulation. Second, we have emphasized aspects with respect to a particular problem (implementation of evidence based practice in social services), and thus our interpretation of these models is necessarily limited. We have not, for example, tried to discuss all of the implications of these models.

3.1 Levin and Roberts' model of human service delivery systems

Levin and Roberts (1976) present a general theory of human service delivery systems where the life cycle of a social service organization is understood in terms of an interaction between demand for services and services rendered. Their main argument is that client outcomes are a function of endogenous organizational processes where demand for services is curtailed by restricting services and lowering quality. A simplified representation of their model is shown in Figure 1.

Specifically, as the demand for services begins to outstrip the agency's available resources for providing high quality services, the agency develops program policies that restrict services. This has two effects. Restricting services lowers program standards, which lowers morale, increasing inefficiencies in service delivery, and thereby further reduces available resources for meeting demand (feedback loop R1 in Figure 1). This process will continue until the erosion of program policies reduces client satisfaction to the point where demand is low enough to eliminate the service effectiveness gap (feedback loop B1). Levin and Roberts argue that more persistent service effectiveness gaps will be addressed through increased community response, which will lead to greater external funding (B2) and more awareness of the services as the community mobilizes to increase funding (R2).

Levin and Roberts apply their general theory of human service delivery systems to three situations: treatment dropout for chemical dependency in a mental health facility, declining student performance in schools, and shortage dental care supply and demand. Each application involves a separate simulation model where they explore the dynamics and possible intervention strategies. All three have relevance to social services. The treatment dropout model, for example, includes structures representing the efficacy of treatment. The student performance model includes interactions between teacher, parent, and student expectations. The dental care model shows how one can model some of the dynamics between latent unmet need for services and acute services.

The problem of implementation of evidence based practice can be conceptualized as intervention to reduce the service effectiveness gap by improving program standards. Of particular interest to researchers focusing on implementation of evidence based practice will be model structures of how efficacy of empirically supported treatments can deteriorate as a function of higher demand for services created by improving services and to a lesser extent, effective advocacy of advocacy groups. If the effectiveness of an empirically supported treatment is not robust over variations in program policies, then it will be rational for staff to reject the innovation as ineffective or harmful to clients. These types of effects will be hard to see because they emerge as the implementation of the innovation leads to more effective services and thus higher demand, as opposed to being a direct consequence of agency characteristics at the time of intervention. A social service agency facing this situation would be a victim of its own success in implementing evidence based practice.

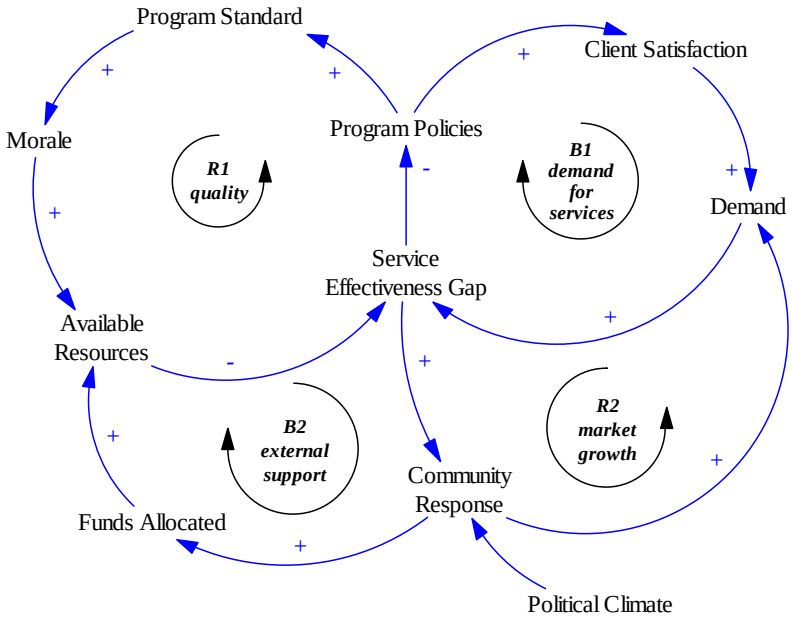

Figure 1 Causal loop diagram of Levin and Roberts' general model of human service delivery system, adapted from Levin and Roberts (1976, p. 36).

Levin and Roberts do not provide empirical support for their reference modes, model parameters, or equations. Such limitations are probably inherent to work conducted in the mid-70's because human service organizations would generally not have been using electronic databases, making the use of such data an unrealistic expectation for the purpose of their project. Hence, their models are conceptual. However, most social service organization or programs now maintain electronic databases of client records and caseloads, which are readily available for secondary analysis.

3.2 Samuel and Jacobsen's model of planned organizational change

Samuel and Jacobsen (1997) develop a model of planned organizational change with a focus on describing how performance changes with the implementation of an innovation. Their emphasis is on understanding how organizations respond to the gap between desired performance and current performance. They base their model on the implementation and organizational change literature, and compare their simulation results against numerical data from three case studies. Figure 3 shows an overview of their model with the major variables and feedback mechanisms.

In Samuel and Jacobsen's model, the initial dip in performance is caused by three reinforcing mechanisms: costs of implementation (R1 in Figure 3), complexity of change (R2), and involvement in decision making (R4). Specifically, as more people in the organization get involved with the implementation process, the costs of lower productivity with using a new innovation become apparent to the organization and raise questions about the suitability of the pacing of implementation. Likewise, complexity of the change increases with the number of people needing to implement it. Both contribute to an increase in resistance to change. And, as resistance to change increases, fewer employees participate in the decision making process,

which leads to even more resistance to change. These three reinforcing mechanisms push performance even lower and form "vicious cycles" during the initial stage of implementation.

As resistance builds and performance continues to decline, however, inducements or incentives are used to overcome resistance to change. The increasing level of resistance leads to the use of performance incentives or reduced caseloads, which have the immediate effect of lowering resistance to change. As more these inducements are applied, resistance declines and performance begins to increase, activating a balancing feedback mechanism (B1). At the same time, inducements add to the overall cost of change. This can lead to a reinforcing mechanism (R3) where the increased costs lower the suitability of pacing, increase resistance to change, and further increase the use of inducements.

In Samuel and Jacobsen's model of organizational change, implementation is a function of how these five feedback mechanisms interact over time. Innovation implementation will succeed if the inducements (B1) are sufficient to tip the direction of the three main feedback mechanisms costs, complexity and involvement (R1, R2, and R4) from being "vicious" cycles that increase resistance and lower performance to "virtuous" cycles that decrease resistance and increase performance. Implementation failure can happens when the need for the need for inducements (R3) begins to dominate.

Samuel and Jacobsen's model of planned organizational change offers a number of insights into the problem of implementing evidence based practice. In their model, the implementation of EBP can be represented as a change to increase performance, where performance would mean client outcomes. One of the first implications of their model is that implementation might lead to an initial *decrease* in client outcomes. The decrease here would be the result of resistance to change, which would be caused by the complexity of the change (e.g., switching over to new forms), costs (e.g., not having enough time to complete paperwork for monitoring client progress or reimbursement of services), and not participating in the decision making.

Second, successful implementation of EBP depends on whether or not the inducements are adequate for tipping the balance of the costs, complexity and involvement feedback mechanisms. Samuel and Jacobsen's model assumes that there is no delay between resistance to change and performance. This is a reasonable assumption when considering activities where the outcomes are immediately (or almost) observable. For example, over the two-year course of some implementation effort, accurate completion of billing forms could be observed on a daily, weekly, or even monthly basis without loss of generality. However, in many social service interventions, performance can only be observed months or years after the initial intervention. So the negative aspects of organizational change are immediately observable while the benefits are only unobservable after long delays. Consequently, it will be harder to get the involvement, complexity, and costs feedback mechanisms to function as virtuous cycles, and social service organizations are at greater risk of falling into the trap of becoming addicted to incentives for reducing resistance to change.

Third, Samuel and Jacobsen's model of planned organizational change highlights the importance of workers' participation in the change process. The complexity and costs associated with organizational change may be hard to anticipate and control, and generally speaking, most

social service agencies have limited resources for offering incentives. However, workers in social service organizations are more likely to be highly committed to their clients, and therefore highly invested in change efforts that have the potential to improve the well-being of their clients. Moving to a more participatory leadership style might therefore be able to change the direction the direction of the reinforcing effects in the involvement feedback mechanism (R4), and thus tip the balance of the two other feedback mechanisms. That is, leadership style could therefore be an important leverage point for managing implementation of evidence based practice.

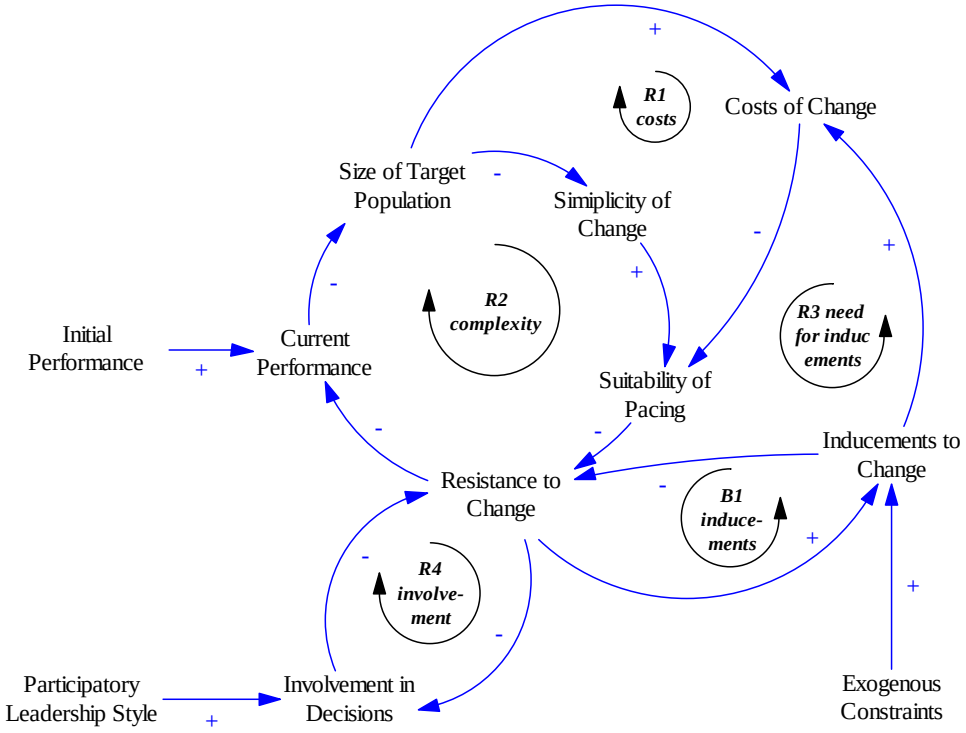

Figure 2 Causal loop diagram of Samuel and Jacobsen's model of planned organizational change, adapted from Samuel and Jacobsen (1997, p. 154).

Samuel and Jacobsen do provide some empirical support for their model by testing their simulated behavior against numerical reference modes from three separate organizations undergoing change. In doing so, they demonstrate how their model passes the behavior reproduction test. Samuel and Jacobsen also draw on some empirical research in formulating their model and equations. This adds to the empirical support of their model, but it is limited and falls short of being more rigorously tested. Their model contains a number of relationships that could be readily tested in a longitudinal study of organizational change. There are now psychometrically sounds measures of organizational concepts such as resistance to change. Moreover, longitudinal methods for studying the organizational variables have advanced considerably in the last 10 years.

3.3 Sastry's model of punctuated organizational change

Sastry's (1997) develops a model of Tushman and Romanelli's (1985) theory of punctuated organizational change. Tushman and Romanelli argue the organizations experience rapid periods of punctuated change and strategic reorientation to overcome organizational inertia. Organizational change can then be thought of as alternating periods of gradual change where competencies and inertia build. Initially these processes help the organization adjust. However, as these same competencies and inertia build, it becomes increasingly difficult for the organization to adjust to a changing environment. A gap between the organization's strategic direction and the organization's environment develops that can only be corrected through a sudden adjustment in the strategic goals of the organization, which Tushman and Romanelli refer to as punctuated organizational change. Sastry's emphasis is on taking the verbal theory from Tushman and Romanelli's and testing its logical consistency using system dynamics. Basing the model on a textual analysis of Tushman and Romanelli and refinement from model testing, Sastry arrives at the model shown in Figure 3.

For an organization to be effective, it most be both competent in the delivery of services, and deliver services that reflect the needs and demands of its environment. Sastry's model represents this by having organizational performance as determinants of (1) appropriateness of the organization's strategic orientation to its environment, and (2) competence (Figure 3). The basic argument is that initially when organizations start out to meet the needs of the environment, their strategic orientation is generally appropriate but because they are new, they do not have much competence in the delivery of services. So organizations build up competencies that lead to improvements in performance (R2 in Figure 3), while learning and socialization institutionalizes the means of service delivery (R1 in Figure 3).

However, as the organization's environment gradually changes, the appropriateness of the organization's strategic orientation declines, leading to a decrease in performance. Unfortunately, the same mechanisms that leads to increasing performance early on now makes it difficult for the organization to realign its strategic goals. Institutionalization that contributes to high performance also contributes to increasing inertia and erodes the organization's ability to change its orientation (R3 in Figure 3). So the organization's strategic appropriateness continues to decline until there is a strategic reorientation (B1 in Figure 3).

There are a number of ways to use Sastry's model to understand the challenges of implementing evidence based practice. First, one can consider the initial decision of an established agency's board of directors or executive direct to commit the organization to a particular model of using evidence based practice. In this situation, client outcomes and organizational performance can oscillate between high and low organizational effectiveness.

Consider, for example, the initial decision to implement evidence based practice within an organization. In the initial stages after the strategic reorientation, competence and organizational performance are low. Client outcomes begin to improve as the staff gain experience and procedures are institutionalized. While the strategic orientation of the agency and environment are aligned, improvements in competence lead to better client outcomes and organizational performance. Eventually, however, the model of implementing evidence based practices obsolesces, and organizational performance begins to decline. However,

institutionalization has eroded the agency's ability to change, and this makes it increasingly difficult for the agency to reorient its services and adopt new models of implementing evidence based practices. Consequently, client outcomes and organizational performance decline further. Eventually the organization undertakes a new strategic reorientation, starting a new period of organizational change. In this scenario, client outcomes and organizational performance oscillate.

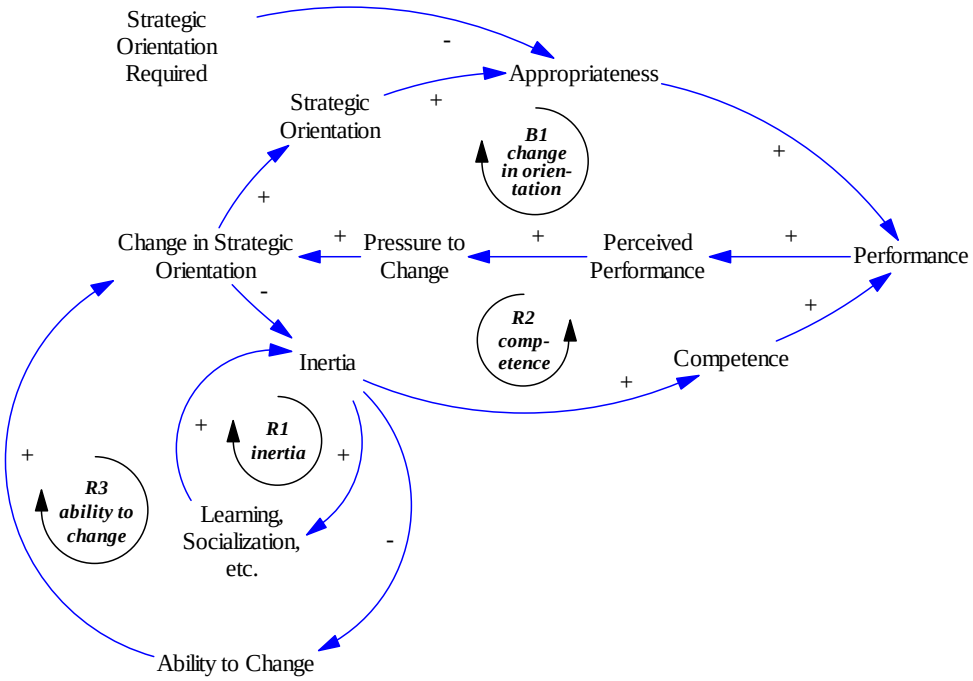

Figure 3 Causal loop diagram of Sastry's model of punctuated organizational change, adapted from Sastry (1997, p. 244).

A key implication from this is that the more one seeks to institutionalize processes to maximize implementation of evidence based practice, the more likely one is to also limit the organization's ability to adapt to a changing environment. Thus short-term performance gains might be offset or limited by longer-term performance declines.

A second aspect of Sastry's model concerns startup agencies. Startups do not have inertia. They therefore have a greater ability to both orient their strategic goals to the needs of the community and implement evidence based practice. Once the startup develops competence, the better environmental fit means that the startup could potentially outperform more established organizations. Such startups would be able to address the idiosyncratic needs of the community and implement evidence based practice. A successful startup would therefore gain recognition in the community as an innovator.

The tendency would be to attribute the startups success to leadership, an innovative business model, etc. This could bring more pressure on established organizations to adjust their strategic orientation and adopt new models of delivering services. High inertia in established

organizations would slow this process, and organizational performance would continue to decline while the startup looked even more successful.

The startup's advantages are, however, temporary. As the agency institutionalizes its procedures and service delivery model, the agency develops inertia that improves competence and outcomes. At the same time, building inertia erodes the organization's ability to change. Paradoxically, the more confident the leadership is with their service delivery model, the more vulnerable the board and executive director are to attribute the initial success to the plan as opposed to initial conditions of starting the organization. If the agency does not invest in a longer term strategy, then it risks become a mediocre organization resistant to change; arguably type of organization that created the niche for innovation.

There are several lessons here about successfully implementing evidence based practice. First, startup agencies with their low inertia may be easier sites to implement evidence based practice than established social service agencies. Second, the agency's capacity to transition from initial startup into a more mature and established organization is critical to the successful implementation of evidence based practice over the long-term.

Sastry's model is primarily aimed at testing the causal logic within existing theory. Testing consists of comparing the model's behavior against descriptions of organizational behavior from Tushman and Romanelli (1985). Although there is empirical support for organizational change being punctuated, the model itself is not tested against empirical data. Sastry's question is tightly focused on whether or not Tushman and Romanelli's theory is logically consistent, and not on whether or not the theory agrees with data. The testing informs refinements in the model and theory, but is not empirically based in the sense that the causal relationships have been rigorously testing against experimental or quasi-experimental time-series designs.

3.4 Repenning's (2002) model of innovation implementation

Repenning (2002) constructs a model of the process of innovation implementation to understand the paradox in organizational theory where organizations reject innovations that improve effectiveness when successfully implemented. Repenning gives the example of Total Quality Management (TQM), an innovation that improves effectiveness and yet fails to be implemented. TQM has been shown to improve the productivity, quality, and market competitiveness of firms, yet successful implementation is rare. The issue here is not about the translation of research to practice. Rather, it is a question about why interventions that by all measures improve effectiveness are not implemented.

Repenning's approach is similar to Sastry in using simulation as a tool for developing more internally consistent theories of an organizational phenomenon. Repenning first develops causal loop diagrams to represent three processes implicated in implementation: reinforcement, diffusion of innovation, and normative pressures. These three processes are represented as in Figure 4. The variables and linkages in the diagram are generally well accepted and empirically based.

In the process of reinforcement, the more committed employees are to the innovation, the more effort they apply to using the innovation and the better the results, which feeds back to increase commitment to the innovation (feedback loop R1 in Figure 4). Reinforcement can function as either a virtuous or vicious cycle. For example, if commitment drops, effort declines along with results, and this justifies a further decline of commitment. In the diffusion of innovation, results (positive or negative) are passed on to others and influence overall commitment, which drives the effort allocated to the innovation, and hence results (feedback loop R2 in Figure 4). This is also a reinforcing mechanism. Good word of mouth will work as a virtuous cycle, while bad word of mouth will work as a vicious cycle. Lastly, there is the managers' process of applying normative pressures. The larger the commitment gap between the commitment to the innovation and the managers' goal, the more pressure managers apply to increasing commitment, which reduces the commitment gap (feedback loop B1 in Figure 4). This works as balancing loop and depends on the managers' goal for commitment.

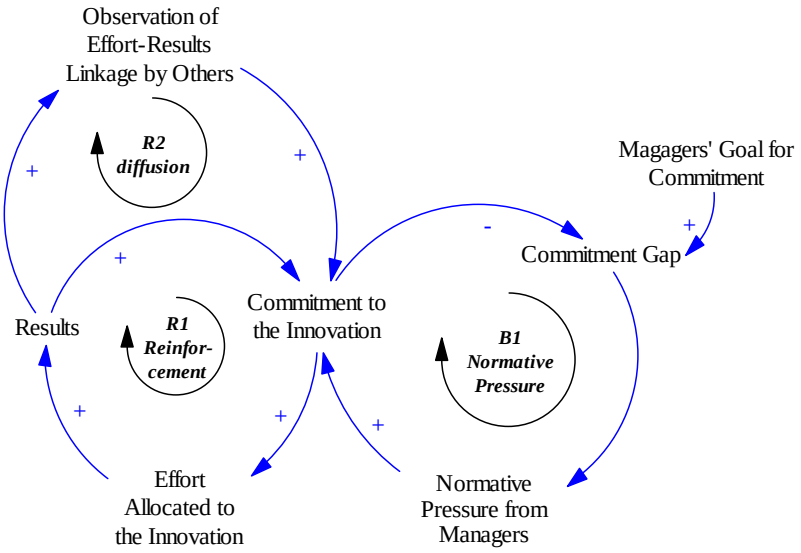

Figure 4 Causal loop diagram of Repenning's model of implementation of TQM, adapted from Repenning's (2002, p. 112).

Next, Repenning develops a simulation model to analyze the implications of these three feedback mechanisms to try and resolve the paradox of how innovations that should improve effectiveness are rejected. Repenning finds that these three feedback mechanisms are able to explain both successful and failed implementation of an innovation. He also finds that duration of managers' goal for commitment play a key role in distinguishing successful from unsuccessful implementation. Specifically, the relationship between how long managers apply normative pressures and successful implementation is highly nonlinear. In essence, there is a "tipping point" where the implementation process changes from being management driven to endogenous to the work process. Past this tipping point, management can withdraw support and the implementation continues. Before this tipping point, withdrawal of management support will

result in implementation failure. Differences of as little as one month can make the difference between a successful and failed implementation.

Repenning's model is grounded in the empirical literature on organizational theory around well accepted mechanisms. The model is also able to explain the two widely observed outcomes of an implementation process. While the model is grounded on empirically based organizational theory, the model itself has not been subjected to empirical studies. That is, the model contains a number of hypotheses about the conditional relationships between variables and temporal relationships between dominant mechanisms.

Repenning's model has two important implications for the implementation of evidence based practice. First, implementation failures of evidence based practice are commonly assumed to derive from the innovation being ineffective outside the research setting. Repenning's work shows how this need not be the case, and that the determinants of fidelity may trump questions about efficacy and effectiveness.

Second, the duration of managers' support plays a key role in the outcome, not just the initial conditions. That is, in Repenning's model what distinguishes the successful from failed implementation is not their readiness to change. Both trajectories start out with the same initial conditions and in this sense are both equally ready to change. What distinguishes the failed from successful implementation is whether or not managers remained committed beyond a tipping point. One could argue that this is a dimension of an organizations' readiness to change, for example, by including an indicator reflecting the likelihood that managers' will remain committed to the change process. However, this seems to largely ignore how determinants of managers' commitment are endogenous to change process itself. Managers respond to the state of the organization, make an assessment, and then decide on a course of action. This is what managers do.

Third, given that the duration of managers' support plays such a key role, increasing the strength and accessibility of the evidence behind the innovation could be a key leverage point for successful implementation of evidence based practice. If extending managers' commitment to implementing an evidence based practice by as little as one month might make the difference between a successful and failed implementation, then increasing the availability of evidence and confidence of managers' in the effectiveness of the intervention could be a key determinant of success. This is an area ripe for future empirical research with potentially high impact on improving the effectiveness of social service organizations.

4. Discussion

All four models help advance the development of causal models of innovation implementation. By identifying a number of causal feedback mechanisms and representing them as system dynamics models, assumptions and relationships between key concepts are made explicit and testable. As running simulation models, they provide a transparent means of evaluating claims about the relationships between the feedback mechanisms and dynamic behavior of the system, leading to a stronger, more internally consistent theory of organizational change. Although all four models use causal loop diagrams to represent the verbal theory, simulation is an essential tool for overcoming the cognitive limitations of trying to draw valid inferences about the causal relationships in dynamic nonlinear systems. Moreover, the models

can be extended and adapted to new situations. This opens up the possibility of developing innovation implementation models specific to evidence based practice in social service organizations.

The four models differ somewhat in their time horizons. Samuel and Jacobsen, and Repenning's models focus on a short timescale around a single innovation implementation. Sastry considers the organization over a longer period of where there is sufficient time for a gap between organization's strategic goals and its environment to emerge, while Levin and Robert's consider the complete life cycle of a human service delivery system. Differences in time horizons imply differences in the problems being considered. The salience of the implications for managers and researchers will therefore depend on what period of time is of most interest. Models focusing on shorter time periods will be most relevant to the questions around a single implementation of evidence based practice, while models focusing longer time horizons will have more relevance to questions around strategic planning and sustaining long-term growth.

The existing models of organizational change and innovation implementation can help us better conceptualize the problem of implementing EBP in social service organizations by providing more logically consistent social theories. They can also help us recognize structural similarities between seemingly dissimilar implementation problems. They do not provide empirically based advice or guidelines on how to proceed with implementing evidence base practice within a specific organization. Instead, the models reviewed here provide prototypical causal stories of how an implementation process might unfold, the causes of failure in each, and what one might do to increase the likelihood of successful implementation.

More research is needed to develop a model of implementing evidence based practice, along with more rigorous empirical studies testing the claims implicit within the models against actual organizational behavior. Toward this end, we conclude by prosing the following research activities as important steps toward the development of a generic structure of the problem facing administrators in social service agencies with implementation of evidence based practice.

1. *Replicate system dynamics studies of implementation against current data.* One of the main benefits of system dynamics in having explicit formulations of causal relationships is that one can replicate previous simulation studies. This would involve building, calibrating, and testing existing models such as those described here against organizational data from implementation efforts. The results would deepen our understanding of existing models and where they fail when tested against data.

2. *Evaluate the impact of delays in client outcomes on implementation.* To a large extent, all the models assumed that performance data was immediately available. This is generally not the case with social service organizations, and introducing such delays between program activities and clinical outcomes could introduce a new dynamics that would be important to consider for the effective delivery of social services. These need to be studied both theoretically and empirically as a way to develop more confidence in the application of system dynamics modeling to implementation research.

3. *Test resource allocation policies against actual behavior.* All of these models contain rate expressions and table functions that have, for the most part, not been tested against actual behavior of service providers in social service organizations. In particular, questions arise about how providers balance adhering to the fidelity of their interventions

against resources (time, billable hours) and large caseloads. Research on organizational culture in social service organizations can have a major effect on outcomes, even when controlling for large caseloads. This suggests that how workers allocate their resources to ensuring treatment fidelity might vary by the organization and its culture. More research is needed to better understand how these types of expressions vary by the organization.

4. *Document stakeholders' mental models of implementing EBP*. Critical to the development of a model of implementing EBP would be a need to establish some face validity of the concepts and perceptions of the problem with implementing EBP. Of particular interest will be descriptions of the mental models that administrators, clinical supervisors, and direct service providers draw on when considering the problem of innovation implementation. More qualitative research is needed to establish the existence of the innovation implementation issues facing administrators within social service organizations.

5. *Build system dynamics models of implementing EBP within a social service organization.* The implications discussed within this paper should be studied by building and simulating a model of the implementation process under various conditions and agencies. This would provide a way to assess to what extent implementing EBP differs from implementing other types of innovations, as well as help identify to what extent one or more of the existing models could be considered a canonical situation model for innovation implementation. More system dynamics modeling is needed to understand the impact of differences characteristics such as the type of innovation, type of organization, and organizational culture on the dynamics of innovation implementation.

6. *Conduct prospective or evaluation research of innovation implementation using system dynamics*. None of these models considered the models of innovation implementation within a prospective study. If the goal of developing generic or canonical situation models is to develop knowledge that helps administrators make better decisions as they plan the implementation of a new innovation, then it seems critical to understand how the use of system dynamics models contributes to outcomes. More prospective quasi-experimental and evaluation research on the impact of stakeholders' using system dynamics on managing organizational change is needed in order to assess and improve the utility of system dynamics research for problem solving and organizational learning.

7. *Develop and empirically test an intervention to increase the duration of managers' commitment to implementing an evidence based practice*. Repenning's work suggests that the duration of managers' commitment to implementing an innovation may be a key leverage point. Developing and testing interventions that increase the duration of managers' commitment by as little one month seems entirely feasible. Moreover, this could involve any number of strategies, from improving the attitudes toward evidence based practice to making the evidence behind innovations more accessible to managers. This would be an innovative line of research, in part, because much of the dissemination of innovations research has focused on making evidence based practices more accessible to the clinicians, as opposed to the managers as key decision makers.

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