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Aligning Selected Systems Thinking Tools to Mitigate Key Challenges Encountered During the Initial Stage of Organizational Change

CAPSTONE REPORT

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Abstract

for

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This paper examines the potential for systems thinking tools to provide ways for organizational leaders (Senge, 1999) to address challenges within the organizational change process. Literature published after 1990 is reviewed concerning challenges encountered in the initiating phase of organizational change (Senge, 1999) and selected systems thinking tools: Causal Loop Diagram, Behavior Over Time graph ("Basic" 2004), The Iceberg (Kim, 1999), and Action-to-Outcome (Jones and Seville, 2003). Conclusions are presented for organizational change leaders.

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CHAPTER I – Purpose of Study

Brief Purpose

The purpose of this paper is to develop a table (see Table 3: Alignment of Systems Thinking Tools and Organizational Change Process Challenges) that presents selected tools of systems thinking, aligned with a set of selected challenges often encountered in the organizational change process, as these are defined by Senge (1999) and Senge and Kaeufer (2000). The intent of this paper is to examine the potential for systems thinking tools to provide ways for organizational leaders (Senge, 1999) to avoid and/or address selected challenges within the organizational change process.

The Ontario Prevention Clearinghouse ("A Discussion," n.d.) describes organizational change as a transformation that moves an organization from process-focused to learning-focused (Senge, 1994). Additionally, McNamara (1999a) states that for a change to be considered "organizational" it has to affect the entire organization and must be outside the standard business process. Examples provided by McNamara (1999a) include a change in vision or mission; or restructuring to address new business, technology, or collaboration. Cowings (2002) further suggests that organizational change may be initiated to respond to "organizational environments" such as competitive, customer, technology, regulatory, economic, or sociocultural changes that occur outside the organization but ultimately influence the organization in some way.

In *The Dance of Change: The Challenges to Sustaining Momentum in Learning Organizations*, Senge (1999) writes in detail about the lifecycle and process for creating organizational change. In this book and a later paper by Senge and Kaeufer (2000), ten challenges that an organization may encounter during the lifecycle of change are identified. These challenges are grouped into three sequential phases identified as "initiating," "sustaining," and "redesigning" (Senge, 1999 and Senge and Kaeufer 2000).

From the writings of Senge (1999) and Senge and Kaeufer (2000), it is clear that challenges of organizational change do occur, and that the types of challenges an organization is likely to encounter can be categorized not only by challenge type but also by phase or timing. For the purpose of this research, the focus is on challenges that occur during the initial phase or "initiating phase" (Senge, 1999) of organizational change. The question is what tools are available to organizational leaders (Senge, 1999) that will help them understand and address these challenges in the context of their own organization.

The larger method of study is literature review (Leedy and Ormrod, 2001). Literature review is chosen as an appropriate method for this study, as the purpose is to understand the relatedness of the variables. Literature is collected from materials published after 1990 in order to locate information pertaining to: (1) challenges during the initiating phase of organizational change as identified by Senge (1999) and (2) selected systems thinking tools: Causal Loop Diagram, Behavior Over Time graph ("Basic" 2004), The Iceberg (Kim, 1999), and Action-to-Outcome (Jones and Seville, 2003).

Once the necessary literature is collected, it is analyzed using conceptual analysis as defined by Palmquist et al. (2005) in order to identify selected tools that potentially provide ways to avoid and/or address selected challenges by analyzing their characteristics.

The results of the initial content analysis are presented in two tables that present: (1) the characteristics of challenges to organizations that arise during the initial stage of organizational change (see Table 1: Characteristics of Challenges Encountered During the Initial Phase of Organizational Change) and (2) the characteristics of situations that use each of the selected systems thinking tools (see Table 2: Characteristics of Selected Systems Thinking Tools).

These characteristics are then framed into the final outcome of the study: Table 3: Alignment of Systems Thinking Tools and Organizational Change Process Challenges. Table 3 presents selected tools of systems thinking, aligned with a set of selected challenges often encountered during the initial stage of the organizational change process. Table 3 is designed for use by organizational leaders (Senge, 1999) and transition change managers, and is supported by discussion that explains why a specific tool would be useful in a particular situation.

Although the primary audience for this paper is organizational leaders as defined by Senge (1999), the outcome of this study may also be useful to executives, managers, and

individual employees ("A Discussion," n.d.) involved in planning for organizational change.

Full Purpose

According to Branch (2002), "Identifying the need for organization-wide change, and leading organizations through that change, is widely recognized as one of the most critical and challenging responsibilities of organizational leadership" (chap.4, pg.1). Challenges that arise during organizational change can affect a business's ability to function and survive (Senge, 1994). Brache (2002) suggests that organizational survival is dependent on "understanding and managing an intricate and entwined set of variables" (p.3). Failure to understand these variables and the challenges they produce can result in failure of an organization to change ("A Discussion," n.d.).

Systems thinking tools provide a means to understand organizational change and the variables that give rise to challenges (McNamara, 1999a). It is through our understanding of these variables that we can identify leverage points that will allow us to successfully implement organizational change (Bellinger, 2004).

Branch (2002) describes organizational change as change that is intentional, organization-wide, and intended to achieve an organizational goal. When framing organizational change in this context, two different levels of change are often discussed: (1) fundamental or transformational; and (2) transitional or transactional (Branch, 2002).

For the purpose of this research, the focus is on the first level – fundamental or transformational.

Organizational change requires a systematic and comprehensive approach; the time required to implement change can span multiple years (Branch, 2002). To assist in the understanding of challenges that can arise during organizational change, Senge (1999) and Senge and Kaeufer (2000) break the change process into three phases. These phases are "initiating," "sustaining," and "redesigning" (Senge, 1999; Senge and Kaeufer, 2000). In Senge's book *The Dance of Change: The Challenges to Sustaining Momentum in Learning Organizations* (1999) and a later paper (Senge and Kaeufer, 2000) the authors describe each phase and the challenges that organizational leaders may encounter during the phases. For the purpose of this research, the focus is on challenges that occur during the initial phase or "initiating phase" (Senge, 1999) of organizational change.

Challenges that arise during the "initiating" (Senge, 1999) phase are grouped together because they are all likely to happen early in the change lifecycle. According to Senge and Kaeufer (2000), four challenges are often encountered during this phase: time, help, relevance, and walking the talk. Time challenges concern the amount of time required to institute a change compared to the time available. Help challenges arise when an organization believes it lacks the expertise to institute change or underestimates the amount of expertise required. Relevance challenges occur when it is not clear to those affected by the change why it should be important to them. Walking the talk challenges

occur when managers, change advocates, or sponsors do not model the behavior they are promoting.

The second phase of organizational change, "sustaining" (Senge, 1999), involves three challenges that often occur as initial problems are resolved and new people are initiated into the change, only to be faced by new problems. During the sustaining phase, fear and anxiety may be prevalent. The challenge is then to effectively manage and minimize the fear. Measurement also becomes a challenge in the second, sustaining phase, in that it is not always clear what or how to measure a change. True believers can also create challenges during the sustaining phase, as their feelings of superiority can create rifts in the organization.

During the final phase of organizational change, identified as "redesigning" (Senge, 1999), challenges occur as changes are transitioned to the larger organization. Integrating changes into new groups can result in governance challenges, as the change must be navigated through different governance systems. This can result in struggles over who has decision powers. This question of power can cause people to attempt to reinvent (or adapt) the change in their own terms, resulting in challenges of diffusion. Additionally, the strategies and purpose used to integrate the change into one group may not successfully apply to different groups.

Systems thinking has been around for many years as a means of understanding systems and how they interact (McNamara, 1999a). The theoretical foundations are based in the

study of system dynamics, founded in 1956 by MIT professor Jay Forrester (Aronson, 2003). The Ontario Prevention Clearinghouse describes systems thinking as "a conceptual framework, which encourages an organization to see patterns of organizational behavior, and then learn to reinforce or change them effectively" (n.d., Fostering Healthy Organizational Change section, para.11). The tools of systems thinking allow organizations to systematically analyze challenges as they arise (Bellinger, 2004).

There are many systems tools available, though deciphering which is best to address a specific challenge can be difficult (Goodman, 1997). The article Getting Started with Systems Thinking: Tools for Organizational Change by Pegasus Communications (2004) identifies Causal Loop Diagrams and Behavior Over Time graphs as basic tools of systems thinking. Daniel Kim (1999) uses The Iceberg as a tool to visualize the depth and breadth of a problem. Jones and Seville (2003) describe an Action-to-Outcome mapping tool, which is useful in examining the potential results of a selected action. While each of the above-mentioned tools may be useful in understanding challenges that arise during organizational change, understanding which tool is best for addressing a specific challenge may not always be clear.

Due to the qualitative nature of this study, the primary research method used to design the study is a literature review (Leedy and Ormrod, 2001). As this research seeks to provide insights into the relationship between challenges in organizational change and system thinking tools based on information presented in published materials, a literature

review is an appropriate method of study (Leedy and Ormrod, 2001). Pertinent materials are collected in the following areas:

- Organizational Change - Literature focused on identifying challenges that arise during the initial stage of organizational change as described by Senge (1999). For the purpose of this study, the scope of analysis is limited to the initial stage of organizational change, because success is impossible in the following stages if the initial stage is unsuccessful.
- Causal Loop Diagrams – Literature identifying the uses and benefits of Causal Loop Diagrams. Causal Loop Diagrams help teams develop shared pictures, or stories, of a situation (Goodman, 1997), which is essential during the initial stage of organizational change.
- Behavior Over Time - Literature identifying the uses and benefits of Behavior Over Time graphs for addressing organizational change. Behavior Over Time graphs are important because they provide an array of perspectives into the challenges of organizational change ("Basic," 2004).
- The Iceberg - Literature identifying the uses and benefits of The Iceberg for addressing organizational change, which is important as it provides a means of visualizing the underlying structures and processes that instigate challenges (Kim, 1999).
- Action-to-Outcome - Literature identifying the uses and benefits of Action-to-Outcome mapping for addressing organizational change. Action-to-Outcome mapping provides teams with a means to investigate the outcomes of a set of actions in an uncertain environment (Jones, and Seville, 2003).

Conceptual analysis as defined by Palmquist et al. (2005) is used as the approach to data analysis, in order to identify the characteristics of the selected systems thinking tools that can potentially provide ways to avoid and/or address selected organizational change challenges. Conceptual analysis is performed in three different stages of research, employing the processes described by Palmquist et al. (2005). Stage one involves reading literature that identifies the characteristics of challenges that occur during the initial stage of organizational change as defined by Senge (1999). The results of the stage one analysis are presented in Table 1: Characteristics of Challenges Encountered During the Initial Phase of Organizational Change. This table presents the selected challenges, their characteristics, and the number of articles in which each characteristic is found.

Stage two involves reading literature about the goals of the selected tools of systems thinking: Causal Loop Diagram, Behavior Over Time graph ("Basic" 2004), The Iceberg (Kim, 1999), and Action-to-Outcome (Jones and Seville, 2003). The results of the stage two analysis are presented in Table 2: Characteristics of Selected Systems Thinking Tools. This table presents the selected systems thinking tools, their characteristics of use or the characteristics of situations in which the tools are used, and the number of articles in which each characteristic is found.

The third stage of the conceptual analysis includes an examination of the results of stage one and stage two and focuses on identifying a correspondences between the

identified characteristics of organizational change challenges and the identified tools of systems thinking.

The results of the three stages of content analysis are summarized in the outcome of the study, presented as a table (see Table 3: Alignment of Systems Thinking Tools and Organizational Change Process Challenges) that shows the characteristics of selected tools of systems thinking, aligned with the challenges often encountered in the initial phase of the organizational change process. The specific systems thinking tools incorporated into Table 3 are: Causal Loop Diagram and Behavior Over Time graph as these are defined by Pegasus Communications Inc. ("Basic," 2004). Other systems thinking tools examined are The Iceberg as defined by Daniel Kim (1999), and Action-to-Outcome as defined by Jones and Seville (2003). These tools are aligned with the organizational change challenges, often encountered in the initial stage of organizational change as defined Senge (1999). This table is supported by the characteristics of each of the challenges and systems thinking tools.

Although the primary audience for this paper is organizational leaders as defined by Senge (1999), the outcome of this study may also be useful to executives, managers, and individual employees ("A Discussion," n.d.) involved in planning for organizational change. The leaders of an organization are not necessarily just the president or CEO of a company. Leaders are characterized by diverse experience, high credibility, and demonstrated leadership skills (Kotter, 1998). According to Kotter (1998), these skills are

necessary to build a strong coalition capable of creating a vision and tackling the challenges that attempt to impede organizational change.

The intent of this study is two fold. One goal is to provide organizational leaders with an appreciation of challenges that occur during the initial stage of organizational change and the characteristics of these challenges. A second goal is to provide organizational leaders with an understanding of systems thinking and possible uses of selected systems thinking tools to assist in investigating variables that lead to these challenges. Once these insights are gained it is anticipated, as viewed from the standpoint of Kotter (1998) and Branch (2002) that organizational leaders can continue to tackle future challenges that arise during the lifecycle of organizational change.

Significance

Burke and Trahant (2000) describe the complex variables that drive the need for carefully planned and managed organizational change. They state:

> Globalization, the disruptive influence of technologies, the emergence of e-business, and growing electronic connectivity among far flung financial markets are all accelerating the pace of commerce throughout the world today – in virtually every industry (Burke and Trahant, 2000, p. xi).

The ability of organizational leaders to understand and respond to world changes and the challenges that arise from them requires a broader focus (McNamara, 1999a) than more traditional management tools can provide (Parrish, 2003).

Kotter (1998) explains "to cope with new technological, competitive, and demographic forces, leaders in every sector have sought to fundamentally alter the way their organizations do business" (pg. 1). One way that organizational leaders have sought to do this is to adopt a systems thinking perspective.

Aronson (1998) explains how systems thinking differs from traditional forms of analysis: it focuses on the problem or challenge being studied as a component of a larger system. He further details how systems thinking is especially useful when the component being studied is complex and receives feedback from internal and external forces, all of which are true of the challenges of organizational change.

In response to these issues, this study seeks to provide organizational leaders with an appreciation of the challenges that occur during the initial stage of organizational change, and an understanding of systems thinking to assist in investigating variables that lead to these challenges. These insights may influence organizational leaders to fundamentally alter the way they address challenges to organizational change. Additionally, by pairing the challenges with the systems thinking tools that have similar characteristics this study may help practitioners choose which systems thinking tools to apply in a given challenge situation.

Limitations

Organizational change can be described as occurring at two different levels: (1) fundamental or transformational; and (2) transitional or transactional (Branch, 2002). As

systems thinking tools are most useful in addressing complex problems that are impacted by the surrounding environment (Aronson, 1998), this research will focus on the first type – fundamental or transformational – as it is the broader of the two.

Though Senge (1999) identifies ten challenges that impede change, this study only investigates challenges that are identified as occurring during the initial stage of organizational change. For this study the researcher takes the position that the initial stage is the most vital stage, because unless organizational leaders are able to navigate the challenges of the initial phase they will never have the opportunity to encounter the remaining challenges.

The tools of systems thinking selected for use in this study are chosen because, according to Kim (1999), they require only a basic understanding of systems thinking while providing a good foundation (Kim, 1999). Additionally, they are all tools with reported usefulness in the initial stage of organizational change.

- Causal Loop Diagrams help teams develop shared pictures, or stories, of a situation (Goodman, 1997), which is essential during the initial stage of organizational change in order to create the motivation for people to buy into the vision.
- Behavior Over Time graphs can provide an array of perspectives into the challenges of organizational change ("Basic," 2004). Having an array of perspectives is vital to being able to address changes that may arise from any corner of the organization (Kotter, 1998).

- The Iceberg can provide a means of understanding the underlying structures and processes that instigate challenges (Kim, 1999). An understanding of the structure, patterns, and events that constitute The Iceberg may help organizational leaders grasp the variables that feed challenges.
- Action-to-Outcome mapping provides teams with a means to investigate the outcomes of a set of actions in an uncertain environment (Jones, and Seville, 2003). As organizational change affects the entire organization, it may be important to test the proposed changes prior to implementing them.

Even though the study of systems thinking has been around for several decades (Aronson, 2003), literature collection for this research is limited to materials published between 1990 and 2005. The early date is chosen because in the paper Systems Thinking: Critical Thinking Skills for the 1990s and Beyond, Richmond (1992) suggests that then current systems thinking tools are adequate but are likely to improve in the coming years.

To ensure the credibility and relevance of the materials selected in the area of organizational change and systems thinking tools, the collection of literature is limited to authors who are members of or affiliated with:

- **Professional or Non-Profit organizations:** The International Society for the Systems Sciences (ISSS), Pegasus Communications, MAP for Nonprofits (MAP)
- **U.S. and Foreign government agencies:** Ontario Prevention Clearinghouse, Office of Science Department of Energy, U.S. Department of Energy Office of Planning and Analysis

- **Professional magazines, journals, and web sites (print and online)**
- **Academic Institutions:** The National Defense University Institute for National Strategic Studies
- **Private Corporations:** case studies
- **Published Books**

The collection of literature is limited to the sources above, based on the assumed knowledge and professionalism of the authors. U.S. and foreign agencies and academic institutes are included, as they are often first to integrate and examine new management and organizational trends. Professional magazines, journals, and web sites are evaluated based on their organizational sponsorships and general status of publishing materials relevant to this study. Individual authors of articles and books are evaluated but not necessarily excluded based on their presence in the fields of organizational change and/or systems thinking; references are also evaluated for the presence of field leaders. Finally, publishing produced by private corporations is included when presented in the form of a case study depicting the use of one of the selected systems thinking tools or the implementation of an organizational change.

The scope of this research is further limited by excluding the following concepts:

- Traditional business analysis tools
- Maintaining organizational health
- Organizational design

Traditional business analysis tools have a very different focus than systems thinking tools. Their purpose is to analyze a specific narrowly defined situation or problem without regard to the larger environment unlike systems thinking tools, which are designed to take in the big picture (Aronson, 1998). For this reason traditional business analysis tools are not evaluated as part of this study.

The challenges of maintaining organizational health or designing an organization are likely to differ in key ways from those of changing an organization. For this reason this study does not presume to cover challenges in these areas. Further research may be needed, both in these areas and in their relationships to systems thinking and organizational change.

Problem Area

Kotter (1998) describes how all organizations must change in order to handle the barrage of internal and external factors to which they must be able to respond in order to survive. Burke and Trahant (2000) identify some of these factors as globalization, disruptive technologies, e-business, and growing electronic connectivity.

Kotter (1998) estimates that fewer than 15 of the more than 100 companies he has studied have been able to accomplish their change goals. This implies that a desire to change is not enough to allow leaders to successfully implement change. He emphasizes

this by stating, "transforming an organization is the ultimate test of leadership, but the understanding of the change process is essential to many aspects of a leader's job" (pg.3).

According to Kotter (1998), when building a change coalition, organizational leaders must reach beyond their enterprise and build alliances within the company to join in leading the change. Successful creation of an organizational change coalition depends less on individuals and their specific roles in the company than on the cohesiveness of the group. He suggests that when building a change coalition, organizational leaders must actively seek out individuals with diverse views to create a coalition with the experience and chemistry necessary to counter resistance, regardless of where in the organization it arises.

The best way for organizational leaders to understand and respond to change is a matter of debate. McNamara (1999a) states that understanding these changes and challenges requires a broader focus – one that goes beyond that which traditional management tools can provide (Parrish, 2003).

One strategy that organizational leaders have adopted to effect change is to diagnose problems by learning to recognize larger patterns of interactions instead of examining the organization in separate pieces (McNamara, 1999a). A specific method that adheres to this strategy is systems thinking (Aronson, 2003). A paper by the Ontario Prevention Clearinghouse describes this way of thinking about the application of systems thinking tools as a conceptual framework. This framework can be used to encourage organizations

to recognize patterns of behavior; this understanding may also allow them to change effectively ("A Discussion", n.d).

Through an understanding of the underlying structure of challenges in organizational change, leaders can start to identify leverage points to effect change within the system (Bellinger, 2004). These leverage points can help an organization alter the structure by changing patterns of behavior to better align with the goals of an organization (Bellinger, 2004).

By providing organizational leaders with information about the characteristics of selected systems thinking tools, this study gives them a useful method for investigating variables that lead to challenges during organizational change. Use of this method may enable organizational leaders to fundamentally alter the way they address challenges to organizational change. In this way, this study seeks to bridge the gap between change attempts and successful change, as described by Kotter (1998).

CHAPTER II – Review of References

The review of references provides a detailed summary of the key literature used in developing the foundation for this research. Key literature is defined as a reference that was fundamental to the development of this research in the area of systems thinking and/or organizational change. Literature reviewed in this section is presented in alphabetical order. Each review includes a summary of the reference, information on how the reference is used in the paper, and the criteria used to determine the acceptability of the reference.

A Discussion Paper on Healthy Organizational Change. (n.d.). Ontario Prevention Clearinghouse. Retrieved March 17, 2005 from http://www.opc.on.ca/english/our_programs/hlth_promo/resources/healthy/healthy_chng.htm

The authors of this paper discuss change as a constant, "change is about transformation…," and discuss how to foster healthy change by creating a learning organization. The paper outlines the elements of change that exist in a capable organization. It also highlights the importance of the individual in the change process. It includes discussion on Senge's five disciplines: systems thinking, personal mastery, mental models, shared vision, and team learning.

This article is used frequently in the Purpose section and Problem Area to establish the importance of using a systems thinking perspective during organizational change and to clarify the audience for this research. The Ontario Prevention Clearinghouse, as a government agency, is believed to write and publish a credible paper. Additionally, the paper cited several leaders in the field of organizational change including Senge.

Aronson, D. (2003). Overview of Systems Thinking. Retrieved March 17, 2005 from http://www.thinking.net/Systems_Thinking/OverviewSTarticle.pdf

Aronson describes the theory of systems thinking and how it grew from the larger field of the study of system dynamics as a method to understand social systems and devise ways to improve them. The author describes systems thinking as a holistic view in which the whole is greater than the sum of the parts. Aronson also discusses the effectiveness of systems thinking to solve problems that are complex, reoccurring, and affected by the larger environments, and that lack obvious solutions.

This article is used to provide information on the founding of the field of systems thinking, presented in the Purpose section of this research. References to this article are also made in the Significance and Limitations sections to describe how systems thinking tools differ from other business analysis tools. Additionally, the definition used for systems thinking tools is derived from this article. The Aronson article is selected based on the prevalence of his writing in the field of systems thinking and his publications with Pegasus Communications, which has a reputation as a renowned publisher of articles and

books in the field of systems thinking and is cited in Senge's book *The Dance of Change: The Challenges to Sustaining Momentum in Learning Organizations* (1999).

Basic Tools of Systems Thinking (2004). Getting Started with Systems Thinking: Tools for Organizational Change. Essential Readings for the Innovative Organization. MA: Pegasus Communications Inc.

This article describes Causal Loop Diagrams, Behavior Over Time graphs and Systems Archetypes as basic tools of systems thinking. It is used in this paper to introduce and define Causal Loop Diagrams and Behavior Over Time graphs in the Purpose and Limitation sections. It is also used to define the categorization of the system thinking literature. Selection of this article is based on Pegasus Communications reputation as a renowned publisher of articles and books in the field of systems thinking and its citation by Senge, in his book, *The Dance of Change: The Challenges to Sustaining Momentum in Learning Organizations* (1999).

Bellinger, G. (2004). Systems Thinking a Disciplined Approach. Retrieved March 17, from http://www.systems-thinking.org/stada/stada.htm

Bellinger's article describes how a systems thinking approach is used to understand events, patterns, and structures. The author presents steps required to view a problem from a systems thinking perspective, including the use of systems thinking tools. He

describes the outcome as leverage points that can be used to develop alternative structures.

Bellinger's article is used to support the Purpose section of this research study by emphasizing the importance of systems thinking tools to organizational change, and the benefits that these tools can provide. Bellinger also provides the basis of the definition for systems thinking. In the Problem Area the article is referenced to highlight the need for leaders to understand the underlying structure of problems in order to create organizational change. The Bellinger article is selected based on the prevalence of his writing in the field of systems thinking and his affiliation with the International Society for the Systems Sciences (ISSS), a leading professional organization.

Branch, K. (2002). Management Benchmark Study. Office of Planning and Analysis, Ch.4. Retrieved April 5, 2005 from http://www.sc.doe.gov/sc-5/benchmark/Ch%204%20Change%20Management%2006.10.02.pdf

Branch provides an overview of change management in terms of organization-wide change. Some of the driving forces behind organizational change and the commitment required from leadership are identified in this chapter. The author also shows how important it is for leaders to understand the literature in the field of change management, and summarizes several theories, approaches, and tools as they relate to change management.

The Branch chapter is used to support the Purpose section of this research study, emphasizing the importance of organizational change and defining organizational change, the different levels of change, and the commitment required of leaders to support change. The article is used again in the Limitations section to support the decision to limit the research to the fundamental or transformational level. The Branch chapter is included as it is published by U.S. Department of Energy Office of Planning and Analysis, a government agency. Additionally, the author cited several leaders in the field of organizational change, including Senge and Kotter.

Cowings, J.S. (2002). Systems Thinking and Learning Organizations. Strategic Leadership and Decision Making. (Ch. 4). Retrieved March 17, 2005 from http://www.ndu.edu/inss/books/Books%20-%201999/Strategic%20Leadership%20and%20Decision-making%20-%20Feb%2099/pt1ch4.html

Cowings' chapter presents an overview of systems paradigms and the key points for implementing a learning organization. Cowings also presents a comprehensive definition of organizational systems. The author discusses organizational interconnectedness with the environment and the importance of understanding the environment and covers data interpretation, information distribution, and memory. In the Purpose section, the Cowings chapter is used to identify the variables that trigger organizational change. The Cowings

chapter is published by The National Defense University Institute for National Strategic Studies.

Goodman, M. (March 1997). Systems Thinking: What, Why, When, and How? *The Systems Thinker: Building Shared Understanding*, 8(2).

The Goodman article describes systems thinking as a whole picture approach that is both a "philosophy" and "diagnostic tool" (Goodman, 1997, pg.12). Goodman describes the importance of team involvement in understanding problems. The article also lists characteristics of situations where use of systems thinking is appropriate.

In the Purpose section, the Goodman article is used to describe the number of systems thinking tools available. It is also used in this paper to introduce and define Causal Loop Diagrams in the Purpose and Limitations sections. Selection of this article is based on Pegasus Communications reputation as a renowned publisher of articles and books in the field of systems thinking and its citation by Senge, in his book, *The Dance of Change: The Challenges to Sustaining Momentum in Learning Organizations* (1999).

Jones, A. and Seville, D. (March 2003) Action-To-Outcome Mapping: Testing Strategy With Systems Thinking. *The Systems Thinker: Building Shared Understanding*, 14(2).

Jones describes Action-To-Outcome mapping: how it can be used to investigate an action chosen by the team, and the possible outcomes and responses.

Jones is used in this paper to introduce and define Action-To-Outcome mapping in the Purpose and Limitation sections. It is also used to define the categorization of the system thinking literature. Selection of this article is based on Pegasus Communications reputation as a renowned publisher of articles and books in the field of systems thinking and is cited in Senge's book *The Dance of Change: The Challenges to Sustaining Momentum in Learning Organizations* (1999).

Kotter, J. P. (1998). Winning at Change. Leader to Leader (10). Retrieved from http://www.pfdf.org/leaderbooks/l2l/fall98/kotter.html

Kotter describes the driving forces behind an organization's need to change and the skills and knowledge that are required for organizational change to be successful. In addition to identifying common problems that occur during organizational change, Kotter also provides possible solutions, emphasizing the role of the organizational change leader.

Kotter is used in the Purpose section to define the audience and describe the characteristics and skills of organizational leaders, and again in the Significance section, highlighting the need for leaders to be able to facilitate change. The article is used to

emphasize how commonly failure can occur when trying to change to address internal and external variables. It is also used to support the goal of the study, providing a tool to bridge the gap between success and failure. Kotter is recognized as a leader in the field of organizational change and is included based on this status.

McNamara, C. (1999a). Thinking About Organizations as Systems. Retrieved March 17, 2005 from http://www.mapnp.org/library/org_thry/org_sytm.htm

The article defines systems and systems thinking and discusses why it is important for organizations. McNamara also outlines the principles of systems thinking:

- Systems behavior depends on its structure
- Systems self balance to achieve perfect size
- Systems seek balance with the environment
- Systems must interact with the environment
- Systems are relationship between parts and whole

McNamara is used to define organizational change and provide examples of how organizational change differs from other changes a company may undergo. The article is used to support the relationship between systems thinking tools and organizational change in the Purpose section. It is also used in the Significance section to emphasis the broad focus leaders need if they are to achieve organizational change. In the Problem Area, the relationship between organization change and systems thinking is punctuated by what McNamara says is the need to recognize organizational change in terms of larger

patterns. McNamara is selected based on the prevalence of his writing in the field and his affiliation with MAP for Nonprofits (MAP), an organization focused building the capacity of nonprofit organizations to achieve mission-driven results and providing quality, affordable management consulting and board recruitment services to thousands of nonprofit groups.

Senge, P.M. (1999). *The Dance of Change: The Challenges to Sustaining Momentum in Learning Organizations*. New York, NY: Currency Doubleday.

Senge's book describes organizational change, how to generate change, and the challenges often encountered in the phases of change: initiating, sustaining, and redesigning. This book is used extensively in this research to help establish the Purpose - from defining organizational leaders to presenting the challenges experienced in the organizational change process - and to define the challenges present during each phase. In the Limitations section, this work is used to support limiting this research to the initiating phase. The challenges identified as occurring during the initiating phase as presented in this book are used to define the coding rules of challenges to organizational change and are used as the initial set of coding terms during the conceptual analysis phase. Senge is recognized as a leader in the field of systems thinking and organizational change and is included based on this status.

Senge, P. M.; Kaeufer, K. H. (October 2000). Creating Change. *Executive Excellence*, 17 (10), p4

Senge and Kaeufer discuss the challenges of creating organizational change; these challenges are grouped into three phases: initiating, sustaining, and redesigning. The article also describes the challenges that occur in each phase and provides strategies for overcoming the challenges. This article is used to supplement the Senge's book *The Dance of Change: The Challenges to Sustaining Momentum in Learning Organizations* in the research and is often cited in the same context. It can be viewed as a summary of Senge's larger work in the area of systems thinking and organizational change.

CHAPTER III - Method

This study is intended to provide insights into the relationship between challenges of organizational change and system thinking tools. The primary research method used is literature review (Leedy and Ormrod, 2001). The purpose of a literature review is to collect, review, and analyze bodies of research on a specific topic to collect data (Leedy and Ormrod, 2001). Literature review is chosen as the primary research method because one of its goals is to understand the relatedness of variables (Leedy and Ormrod, 2001). In the case of this study, the variables are defined as challenges to organizational change and systems thinking tools.

The data analysis approach selected for use in this study is conceptual analysis, defined by Leedy and Ormrod (2001) as the systematic analysis of the collected data for identifying themes or patterns. The specific conceptual analysis process adapted for use in this study is articulated by Palmquist et al. (2005). This eight step process is chosen as the means of identifying the characteristics of selected system thinking tools and challenges to organizational change that occur during the initial stage, as these elements appear in the literature.

Data Collection

Initial data collection for this study focused in two areas; (1) literature related to organizational change and (2) literature related to systems thinking. These initial searches

are conducted using the Internet. The following concepts are used to drive literature selection: organizational change, challenges to organizational change, systems thinking, and systems thinking tools. These terms are selected by reviewing literature on organizational change and systems thinking that are part of the researcher's private library. These initial searches resulted in identification of: 3 journals, 6 relevant web sites, 2 articles, and 1 reference to Senge's books, which are used to develop additional search terms. Literature identified during this initial search is scanned for keywords. These keywords are then used to define additional search terms for searching the internet, electronic databases, and book reviews for additional literature.

The resulting search terms are grouped into two primary categories:

(1) Search terms targeted at identifying challenges of organizational change:

- Organizational issues
- Organizational problems
- Business environmental analysis tools
- Environmental uncertainty
- Typical organizational problems
- Typical organizational issues
- Typical organizational challenges
- Definition of organizational change lifecycle
- Organizational issues
- Management of organizations references

(2) Search terms targeted at identifying systems thinking:

- System thinking tools organizational health
- System thinking tools organizational change
- System thinking tools uses
- System thinking tools application
- System thinking tools
- Systems paradigm
- Using the tools of systems thinking
- Goals of systems thinking tools
- Tools for systems thinking
- Getting started with systems thinking
- Causal Loop Diagram
- Behavior Over Time graphs
- The Iceberg
- Action-to-Outcome mapping

A third category is targeted at finding literature with explicit ties to the goal of this study; the use of systems thinking tools to address challenges to organizational change:

- Using system thinking tools to solve organizational problems
- System thinking tools organizational problems
- Organizational change and systems thinking
- Organizations and systems thinking

These search terms are then used to search the internet using the search engine Google (www.google.com), the web crawler DOGPILE (www.dogpile.com), and internet based databases and report repositories:

- **Gartner** – Online provider of research and analysis on the global IT industry.
- **Forester** – Online access to independent technology research company.
- **EBSCO Host Research Data –** Online access to print and electronic journal subscription services, research database development and production, online access to more than 100 databases and thousands of e-journals, and e-commerce book procurement.

These searches produced 9 web sites, 36 articles, and 2 books that are relevant to the study. When a relevant source is identified, the link is copied into a spreadsheet organized by the search type and keyword. A source's relevance is determined by quickly scanning the content for relationships to systems thinking or organizational change. Systems thinking literature related to the selected tools or general systems thinking overview are reserved and all others are discarded. Literature on the topic of organizational change is also reviewed. If a source references organizational change or challenges of organizational change, it is reserved. Also noted in the spreadsheet is the type of source: website, article, or book. The process produced many relevant sources including Senge's books, cited in this research. Additional sources are located by reducing the link to its root, clicking on a homepage link, or clicking on referenced links to locate other relevant literature. Using this method, an additional 2 websites, 22 articles,

and 1 book are located. The sites listed below, individual articles, and books from the researcher's private library made up the majority of the materials used for this research.

- **Pegasus Communications** (http://www.pegasuscom.com/) – Online provider of conferences, newsletters and other publications, and other materials for the systems thinking community.
- **Free Management Library** (http://www.managementhelp.org/topics.htm) - Library of management resources for nonprofit and for-profit businesses.
- **Mental Model Musings** (http://www.systems-thinking.org/) - A web site dedicated to systems thinking and its application to businesses and organizations.
- **Thinking Page** (http://www.thinking.net/) - Online source for information on improving organizational and individual thinking.

Data Analysis

Conceptual analysis involves quantifying and tallying the presence of characteristics of the selected systems thinking tools and challenges of organizational change as defined by Senge (1999). This analysis is performed employing the eight step process described by Palmquist et al. (2005). Conceptual analysis for this research is conducted in three stages.

Prior to beginning the analysis process the selected literature is divided into two groups: (1) literature about the challenges of organizational change and (2) literature about system thinking tools. When possible this latter category is further broken out by

the specific tool: Causal Loop Diagram, Behavior Over Time graph ("Basic" 2004), The Iceberg (Kim, 1999), and Action-to-Outcome (Jones and Seville, 2003).

Coding Guidelines for Stage One Content Analysis

In stage one of the conceptual analysis process, literature regarding organizational change is read to identify challenges. Coding of the literature pertaining to the four challenges encountered during the initial stage of organizational change as defined by Senge (1999), including time, help, relevance, and walking the talk is conducted using a pre-defined set of concepts (Palmquist et al., 2005).

Organizational change data are coded for the existence of concepts rather than for frequency (Palmquist, 2005). Due to the diversity of the literature reviewed, coding for frequency will not enhance the interpretation of the data. Additionally, as the intent of stage one is to determine characteristics of challenges to organizational change. Terms used in coding are applied broadly. This means that synonyms, business jargon, and phrases are included in the coding (Palmquist, 2005).

Literature on the challenges of organizational change is reviewed as a whole in order to understand context to the fullest extent and no text is considered irrelevant (Palmquist, 2005). If the text contains synonyms, business jargon, or phrases related in some apparent manner to the four challenges encountered during the initial stage of organizational change as defined by Senge (1999), it is considered relevant.

The results of stage one content analysis are tracked using Excel. An example of the coding template can be seen below, in Figure 1.

Challenge of Organizational Change	Characteristic	# Articles
Time		
Help		
Relevance		
Walking the talk		

Figure 1: Stage One Coding Template

The resulting output of stage one is a table (see Table 1: Characteristics of Challenges Encountered During the Initial Phase of Organizational Change) that presents the characteristics of each of the challenges that occur during the initial phase of organizational change as defined by Senge (1999).

Coding Guidelines for Stage Two Content Analysis

Stage two of the conceptual analysis process involves reading literature on the selected tools of systems thinking: Causal Loop Diagram, Behavior Over Time graph ("Basic" 2004), The Iceberg (Kim, 1999), and Action-to-Outcome (Jones and Seville, 2003).

Literature on systems thinking tools is divided into selections by the tool addressed and each section is coded separately for characteristics of use. Text that pertains to tools

outside those addressed in this research is considered irrelevant and ignored (Palmquist, 2005).

Coding of stage two literature regarding systems thinking tools is conducted using a pre-defined set of concepts (Palmquist, 2005) based on the positive characteristics of use and negative characteristics of use. Positive characteristics are defined as situations in which the tool is used effectively, as reported in a given context and negative characteristics are defined as situations in which the tool use is reported to be ineffective.

As in stage one, systems thinking tool data are coded for the existence of concepts and not frequency (Palmquist, 2005). As in stage one, synonyms, business jargon, and phrases are included in the coding (Palmquist, 2005).

The results of stage two content analysis are tracked using Excel. An example of the coding template can be seen below in Figure 2.

System Thinking Tool	Characteristic	# Articles
Behavior Over Time graph		
The Iceberg		
Action-to-Outcome mapping		
Causal Loop Diagram		

Figure 2: Stage Two Coding Template

The resulting output of stage two is a table (see Table 2: Characteristics of Selected Systems Thinking Tools) that presents the characteristics of each of the selected systems thinking tools.

Coding Guidelines for Stage Three Content Analysis

In stage three the output of stages one and two are compared. In coding for stage three, data are coded for potential overlaps of concepts (Palmquist, 2005). The positive and negative characteristics of each tool complied in stage two are compared to the characteristics of each challenge compiled in stage one. When a positive tool characteristic is found to match a challenge characteristic it is noted as +1. When a negative tool characteristic is found to match a challenge characteristic it is noted as -1. The results are tracked in a matrix presenting challenges by tool (see Appendix D).

The results of stage three content analysis are tracked using Excel. An example of the coding template can be seen below in Figure 3.

		Behavior Over Time			Iceberg Theory			Causal Loop Diagram			Action-to-Outcome		
		Characteristic 1	Characteristic 2	Characteristic 3	Characteristic 1	Characteristic 2	Characteristic 3	Characteristic 1	Characteristic 2	Characteristic 3	Characteristic 1	Characteristic 2	Characteristic 3
Time	Characteristic 1												
	Characteristic 2												
	Characteristic 3												
Help	Characteristic 1												
	Characteristic 2												
	Characteristic 3												
Relevance	Characteristic 1												
	Characteristic 2												
	Characteristic 3												
Walk the talk	Characteristic 1												
	Characteristic 2												
	Characteristic 3												

Figure 3: Stage Three Coding Template

Data Presentation

The combined results of the content analyses are framed and summarized in a table (see Table 3: Alignment of Systems Thinking Tools and Organizational Change Process Challenges) that presents the selected tools of systems thinking, aligned with the challenges often encountered in the initial phase of the organizational change process. Table 3 identifies the matched positive and negative characteristics, as these are defined above in the Data Analysis section. Positive characteristics appear in green and negative characteristics appear in red. A template for the design of this final outcome of the study is presented below in Figure 4.

	Behavior Over Time	Iceberg Theory	Causal Loop Diagram	Action-to-Outcome
Time				
Help				
Relevance				
Walking the talk				

Figure 4: Template for Table 3 – Final Outcome of Study

Table 3 is supported by a discussion explaining the alignment of the systems thinking tools and the challenges of organizational change. The goal of Table 3: Alignment of Systems Thinking Tools and Organizational Change Process Challenges is to help organizational leaders determine when to use a specific tool. The goal of the discussion is to provide organizational leaders with the knowledge of why a specific tool would be successful in a particular situation. This combination of "when" and "why" should provide organizational leaders with the tools and knowledge to alter existing patterns of behavior in order to produce a desired change (Bellinger, 2004) and have a better chance at transforming an organization (Kotter, 1998).

CHAPTER IV – Analysis of Data

The Report of Stage One Content Analysis

As described in the Data Analysis section of Chapter III, stage one content analysis focuses on quantifying and tallying the presence of characteristics of selected challenges often encountered during organizational change processes, as defined by Senge (1999). Data from four sources is analyzed for this purpose, following the guidelines outlined in Coding Guidelines for Stage One Content Analysis, presented in Chapter III.

Stage one content analysis focuses on identifying the characteristics of the four challenges encountered during the initial stage of organizational change as defined by Senge (1999), including, time, help, relevance, and walking the talk. In order to understand the literature to the fullest extent, each article is reviewed as a whole and no text is considered irrelevant. Each data source is reviewed twice, once to identify the challenge type: time, help, relevance, or walking the talk, and a second time to identify the challenge characteristics. The data are then transferred to an Excel spreadsheet where they are reviewed, and multiple occurrences of a characteristic are eliminated. At the same time, keywords are highlighted to emphasize the characteristic and the surrounding text is maintained to provide context. The results of this analysis can be seen in Appendix B – Initial Organizational Challenge Characteristic List.

The goal during stage one data analysis is to compile a single list of characteristics for each challenge. The resulting characteristics for each challenge are compiled in an Excel spreadsheet and multiple occurrences of a characteristic are eliminated. The number of data sources that includes each characteristic is also noted. The results of this analysis can be seen in Table 1: Characteristics of Challenges Encountered During the Initial Phase of Organizational Change.

Table 1: Characteristics of Challenges Encountered During the Initial Phase of Organizational Change

Table 1.1: Time

Challenge	Characteristic	# Articles
Time	Benefits from an investment in **learning initiatives**	1
	If time invested is low, then time scarcity will limit project growth by 1) "time invested in the initiative will be ineffective," 2) "people will be unwilling to commit in the first place"; this is a **limiting process**	3
	Leverage lies in **investigating the tacit assumptions and attitudes** that underlie the lack of time flexibility	1
	Schedule **time for focus** and concentration, value unstructured time, experiment with time; reflection, dialogue, discussion, practice, and learning	2
	Trust people to control their own use of time	2
	Say no to political games and nonessential demands	2
	Establish a **sense of urgency**; change will take longer than you think	2
	Recognize that **time is a strategic resource**; manage and operate in multiple timelines / timeframes	3
	Plan for and create short term wins; **balance these short term results with long term vision** for sustained success, do not declare victory before the war is over	3
	Integrate initiatives, set a focus, build capabilities for eliminating busy work, and help people make appropriate trade-offs	2

Table 1.2: Help

Challenge	Characteristic	# Articles
Help	Building **self-awareness**, on both and individual and team level	2
	Gap between the group's current performance and its aspirations	1
	Understand **attitudes** about seeking help	4
	Doubt that there are **effective means** to accomplish major organizational change	1
	Build a **guiding coalition**	2
	Work with people outside your organization, consider using a **consultant**	2
	Work as a **team,** not just a collection of individuals	3
	Investigate the **need for help** early and invest early	2
	Create **internal capacity for coaching** into line managers responsibilities	3
	Find **partners** who can counsel one another	3

Table 1.3: Relevance

Challenge	Characteristic	# Articles
Relevance	Failure to **develop a compelling business case** for change precludes any significant momentum from developing	3
	Establish a clear strategy behind the initiative by establishing a **clear, authentic, convincing story about the relevance** of a change initiative	2
	Tie initiatives to the **big picture**, business and customer needs, and the business's long-term health	2
	If a **commitment gap** develops people will not participate fully	2
	Underlying limit or constraint behind this challenge is management's ability to widely **communicate a clear business case** for change	2
	Potential **long delays** before business results improve can be discouraging	1
	Requires a **critical number of leaders**	1
	Strong level of **trust** among pilot group members develop with **shared vision** exercises	1
	Explicitly **raise questions of relevance** in pilot groups and revisit relevance periodically	2
	Make **information** available to pilot group members	2
	Keep training linked tightly to **business results**	1
	Increased and sustained **communications and education on the vision**	2
	Identify every possible v**ariable that contributes to complacency;** brainstorm specific ways to counter each variable	1
	Build awareness among team leaders	1
	Make sure that people who become **enthusiastic don't alienate others**	2

Table 1.4: Walking the Talk

Challenge	Characteristic	# Articles
Walking the Talk	Need individuals to take responsibility for changes and new ways of operating; **empower others** to act on the vision	2
	Business as usual is how the challenge perpetuates itself, insidiously and unseen, masked by complacency, resignation, and taken-for-granted political games-playing	2
	Assumptions will only change gradually, through reflection, experimentation, and example; **reflection gap** develops if people do not become more reflective	3
	Limiting process, trust required increases and the previously taken-for-granted low trust becomes an issue, creating a **trust gap**	2
	With **credible and authentic advocates**, the credibility of the initiative will benefit	2
	Requires a **shared understanding** of the values of company	2
	Build the credibility by demonstration, not by articulation; lead by example	4
	Work with **partners,** a partner is someone with whom we can speak openly and challenge our thinking	2
	Cultivate **patience under pressure**	2
	Reflect on values and think carefully about your **beliefs about people**	3
	Develop a greater sense of **organizational awareness**	2
	Many are **inherently cynical** about change	3
	Organization-wide change often goes against the very **values** held dear by members; keep perspective	2
	Get as much **feedback** as practical	1
	Align behaviors on the part of senior executives	3
	Leaders must **win the support** of employees, partners, investors, and regulators	2
	Willingness to push themselves out of their own comfort zones and take risks; **quest for learning**	3
	Develop aims and values that are credible; **underlying limit is the clarity and credibility**	2

The Report of Stage Two Content Analysis

The purpose of stage two content analysis is to quantify and tally the presence of characteristics of selected systems thinking tools. Data from fourteen sources is analyzed, following the guidelines outlined in Coding Guidelines for Stage Two Content Analysis, presented in Chapter III.

Stage two content analysis focuses on identifying the characteristics of four systems thinking tools: Causal Loop Diagram, Behavior Over Time graph ("Basic" 2004), The Iceberg (Kim, 1999), and Action-to-Outcome (Jones and Seville, 2003). During stage two the goal of the data analysis is to compile two lists for each of the four selected systems thinking tools. One list presents the positive characteristics of the particular tool and the other list presents the negative characteristics. Some references address characteristics of multiple tools. In these cases, only text pertaining to a selected tool is coded for characteristics. Each data source is reviewed once. During the coding process, both positive and negative characteristics are identified and differentiated with different colored highlighter markers. Data from each data source are then compiled in an Excel spreadsheet where they are reviewed and multiple occurrences of a characteristic are eliminated. At the same time, keywords are highlighted to emphasis the characteristic and the surrounding text is maintained to provide context. The results of this analysis can be seen in Appendix C – Initial Systems Thinking Tools Characteristic List.

The resulting lists of positive and negative characteristics for each of the four selected systems thinking tools are compiled in an Excel spreadsheet, multiple occurrences of a characteristic are eliminated and the number of data sources that includes each characteristic is noted. Because no negative characteristics are identified during this stage, they are excluded from the remainder of the study. The results of this analysis can be seen in Table 2: Characteristics of Selected Systems Thinking Tools.

Table 2: Characteristics of Selected Systems Thinking Tools

Table 2.1: Behavior Over Time (BOT)

Systems Thinking Tool	Combined	# Articles
Behavior Over Time (BOT)	**Easy** to learn and use	2
	Medium to **formulate thoughts more carefully and broadly and express them**	3
	Forces **explicitness**	2
	Begin to **focus on change** over time rather than focusing on static events	5
	Look at the change itself, and what is causing it, the **underlying system structure and mindset**	5
	Understanding of the issue and **team members perception** of it; different interpretations of the stated variables are definitely possible	5
	Recognize **exponential growth**	2
	Understand what happens if you change the **behavior of the variables over time**	5
	Should not include **qualitative** words	1
	Map multiple variable on graph; variables can be compared for possible **interdependencies and causal relationships**	5
	Engaging work and lively **discussions**	5
	Prepare people for further work in system dynamic thinking and **develop dynamic thinking skills**	2
	Does not require that variable can be measured in conventional units **soft variables** can be examined	1
	Focus discussion on variables that are the most **important and central to the issue**	3
	Work **individually or in groups**	2
	Support by **management** (conducting BOT)	1
	Helps to have **someone with whom to discuss ideas and obstacles** (planning BOT session)	1
	Willingness to make mistakes, start over	1
	Requires **time to think**	1
	Identify **leverage points**	2
	Understand difficult **delayed dynamics**	
	Value of the mapping comes from the **creation and shared analysis of the maps**	2
	Use to examine **patterns of behavior and their causes**	3
	Big picture	1
	Generate hypotheses	3

Table 2.2: The Iceberg

Systems Thinking Tool	Combined	# Articles
The Iceberg	**Story telling** in a group	2
	A simple three level diagram used to **differentiate events, patterns, and structures**	2
	Encourage looking more deeply for the **underlying structure** to help understand what's going on and why; begin identifying higher-leverage actions	5
	Causal connection	3
	Mental models, these are an even deeper kind of structure, showing different ways of seeing the world	5
	Combination of **top-down and bottom-up strategies**	2
	Seek to **close the gap between current performance and an organizations potential**	1
	Helps us to understand deeply **ingrained assumptions** about how the world works; shape our habits and minds	4
	Developing an **image of an organizational structure**, a problem area, or the future, we gain insight into how our organization operates and what it will take to change	2
	Capabilities of the system as a whole or the interrelationship of processes especially as they relate to the **overall goals**	2
	Consensus building, **participatory decision-making**, and all the other skills needed for teams to function effectively	2
	Trust that the resulting shifts in power will be of benefit to the organization	
	Shift from this event orientation to focusing on the internal system structure, you improve possibility of improving business performance	4
	Patterns are trends or changes in events over time	3

Table 2.3: Causal Loop Diagram

Systems Thinking Tool	Combined	# Articles
Casual Loop Diagram	**Diverse action-oriented teams**	2
	Specific help in addressing questions	
	Exploring the existing causal theory; **chain of cause and effect**	3
	Uncovering **critical mindsets**	3
	Looking for **opportunities**	2
	Identify **intermediate indicators** that the group can use to measure process	3
	Identify important **reinforcing loops** that the group's actions may trigger	
	Ways that the **actions may get amplified** and lead to goals	2
	Understanding how the system can resist change or push back on the group's effort through **balancing loops**	2
	Reveals possible problems that the team needs to address in the strategy, but also an important disconnect between the intermediate **indicators and long term goals**	2
	Listing of **external forces**, while sobering, helps the group see how it's actions fit into a larger picture and prompts members to consider how they might influence any of the external factors	3
	Identify potential supporting actions, new areas of focus, and areas for further exploration	2
	Account the important **feedback affects**	2
	Surfacing a team's **assumptions**	2
	Maintaining a focus on **strategy**	2
	Direct action based on the **data collection and analysis**	2
	Focus the group conversation on the most critical strategic issues or questions, **facilitation methodology**	3
	Identify systemic **drivers of change and leverage points**	3

Table 2.4: Action-to-Outcome

Systems Thinking Tool	Combined	# Articles
Action to Outcome	Understand the system structures which **cause the pattern of behavior**	3
	Graphically presents relationships that are difficult to verbally describe	2
	It is often necessary to consider **feedback within management systems** to understand what is causing the patterns of behavior	
	Starting point for analyzing what is causing a **particular pattern of behavior**	2
	Helps to show **balancing structures** in which the difference between the desired state and the current state creates a **gap**	3
	Multiple actors within the system, each with their own **perceptions** of what the desired state should be	2
	Develop a **collective understanding taking into account the purpose and the audience**	2
	May be perceived that the effort necessary to **develop alignment is an investment** for which the necessary **time and energy** are not available	1
	Understand and **communicate the interactions** that determine the dynamics of a system	3
	Show causal relationship and **illustrates circular feedback**	2
	Help you **tell a story or express you interpretations or mental models** of how a system works	2
	Indicate the **effect of the influence**	1
	If there is significant amount of time between the action of one variable and the reaction of the next variable in the loop, a **time delay** can be indicated	2
	Hypothesize about solutions to your problem and then test them	1
	Helps show reinforcing loops: **compound change** in one direction with more change in the other direction	1
	Helps identify resist change: **if growth falters or never quite starts; unproductive behavior never gets dropped**	1

Report of Stage Three Content Analysis

The purpose of stage three content analysis is to align the characteristics of challenges encountered during the initial stage of organizational change with the characteristics of selected systems thinking tools. Data collected during stage one and two are analyzed, following the guidelines outlined in Coding Guidelines for Stage Three Content Analysis,

presented in Chapter III. (See Appendix B – Initial Organizational Challenge Characteristic List and Appendix C – Initial Systems Thinking Tools Characteristic List).

Stage three content analysis focuses on identifying the common characteristics of the four challenges encountered during the initial stage of organizational change and characteristics of the four systems thinking tools. During stage three the goal of the data analysis is to compile a list of common characteristics between selected challenges to organizational change and selected systems thinking tools. To achieve this goal, using the characteristics listed in Tables 1 and 2, each characteristic of the challenges to organizational change is compared to each characteristic identified for the systems thinking tools. Since the language and wording of the characteristics is not identical, the characteristics are evaluated for meaning or goal, not keywords. Data collected in stage one and two are compiled in an Excel spreadsheet where it is reviewed. Occurrences of common characteristics are marked with an "x." The results of this analysis can be seen in Appendix D – Organizational Change Challenges and Systems Thinking Tools Characteristic Matrix.

Data from the resulting matrix are compiled. Characteristics of systems thinking tools that are similar to characteristics of challenges to organizational change are listed in an Excel spreadsheet. If a specific systems thinking tool characteristic matches multiple challenge characteristics, this is marked in the Excel worksheet but the characteristic is only recorded once in the final table. The results of this analysis can be seen in Table 3: Alignment of Systems Thinking Tools and Organizational Change Process Challenges.

Table 3: Alignment of Systems Thinking Tools and Organizational Change Process Challenges

Table 3.1: Time

	Behavior Over Time	The Iceberg	Causal Loop Diagram	Action-to-Outcome
Time	Begin to **focus on change** over time rather than focusing on static events	Seek to **close the gap between current performance and an organizations potential**	**Diverse action-oriented teams**	It is often necessary to consider **feedback within management systems** to understand what is causing the patterns of behavior
	Understanding of the issue and **team members perception** of it; different interpretations of the stated variables are definitely possible	Helps us to understand deeply **ingrained assumptions** about how the world works; shape our habits and minds	Identify important **reinforcing loops** that the group's actions may trigger	Starting point for analyzing what is causing a **particular pattern of behavior**
	Map multiple variable on graph; variables can be compared for possible **interdependencies and causal relationships**	Capabilities of the system as a whole or the interrelationship of processes especially as they relate to the **overall goals**	Reveals possible problems that the team needs to address in the strategy, but also an important disconnect between the intermediate **indicators and long term goals**	Helps to show **balancing structures** in which the difference between the desired state and the current state creates a **gap**
	Does not require that variable can be measured in conventional units **soft variables** can be examined	Consensus building, **participatory decision-making**, and all the other skills needed for teams to function effectively	**Identify potential** supporting actions, new areas of focus, and areas for further exploration	May be perceived that the effort necessary to **develop alignment is an investment** for which the necessary **time and energy** are not available
	Focus discussion on variables that are the most **important and central to the issue**		Surfacing a team's **assumptions**	
	Requires **time to think**		Maintaining a focus on **strategy**	
			Focus the group conversation on the most critical strategic issues or questions, **facilitation methodology**	

Table 3.2: Help

	Behavior Over Time	The Iceberg	Causal Loop Diagram	Action-to-Outcome
Help	Look at the change itself, and what is causing it, the **underlying system structure and mindset**	**Mental models**, these are an even deeper kind of structure, showing different ways of seeing the world	Uncovering **critical mindsets**	Multiple actors within the system, each with their own **perceptions** of what the desired state should be
	Understanding of the issue and **team members perception** of it; different interpretations of the stated variables are definitely possible	Combination of **top-down and bottom-up strategies**	Ways that the **actions may get amplified** and lead to goals	Develop a **collective understanding taking into account the purpose and the audience**
	Work **individually or in groups**	Seek to **close the gap between current performance and an organizations potential**	**Focus the group conversation** on the most critical strategic issues or questions, **facilitation methodology**	Understand and **communicate the interactions** that determine the dynamics of a system
	Helps to have **someone with whom to discuss ideas and obstacles** (planning BOT session)	Helps us to understand deeply **ingrained assumptions** about how the world works; shape our habits and minds	Identify systemic **drivers of change and leverage points**	

Table 3.3: Relevance

	Behavior Over Time	The Iceberg	Causal Loop Diagram	Action-to-Outcome
Relevance	**Easy** to learn and use	**Story telling** in a group	**Specific help in addressing questions**	Understand the system structures which **cause the pattern of behavior**
	Medium to **formulate thoughts more carefully and broadly and express them**	A simple three level diagram used to **differentiate events, patterns, and structures**	Exploring the existing causal theory; **chain of cause and effect**	**Graphically presents relationships** that are difficult to verbally describe
	Focus discussion on variables that are the most **important and central to the issue**	Encourage looking more deeply for the **underlying structure** to help understand what's going on and why; begin identifying higher-leverage actions	Identify **intermediate indicators** that the group can use to measure process	Understand and **communicate the interactions** that determine the dynamics of a system
	Understand difficult **delayed dynamics**	Developing an **image of an organizational structure**, a problem area, or the future, we gain insight into how our organization operates and what it will take to change	Ways that the **actions may get amplified** and lead to goals	Show causal relationship and **illustrates circular feedback**
	Big picture	Consensus building, **participatory decision-making**, and all the other skills needed for teams to function effectively	Reveals possible problems that the team needs to address in the strategy, but also an important disconnect between the intermediate **indicators and long term goals**	Help you **tell a story or express you interpretations or mental models** of how a system works
		Trust that the resulting shifts in power will be of benefit to the organization	Listing of **external forces**, while sobering, helps the group see how it's actions fit into a larger picture and prompts members to consider how they might influence any of the external factors	If there is significant amount of time between the action of one variable and the reaction of the next variable in the loop, a **time delay** can be indicated
		Shift from this event orientation to focusing on the internal system structure, you improve possibility of improving business performance	Direct action based on the **data collection and analysis**	Helps identify resist change: **if growth falters or never quite starts; unproductive behavior never gets dropped**
			Focus the group conversation on the most critical strategic issues or questions, **facilitation methodology**	

Table 3.4: Walking the talk

	Behavior Over Time	The Iceberg	Causal Loop Diagram	Action-to-Outcome
Walking the talk	Prepare people for further work in system dynamic thinking and **develop dynamic thinking skills**	A simple three level diagram used to **differentiate events, patterns, and structures**	**Diverse action-oriented teams**	Starting point for analyzing what is causing a **particular pattern of behavior**
	Does not require that variable can be measured in conventional units **soft variables** can be examined	**Mental models**, these are an even deeper kind of structure, showing different ways of seeing the world	Looking for **opportunities**	Multiple actors within the system, each with their own **perceptions** of what the desired state should be
	Helps to have **someone with whom to discuss ideas and obstacles** (planning BOT session)	Combination of **top-down and bottom-up strategies**	Identify important **reinforcing loops** that the group's actions may trigger	Understand and **communicate the interactions** that determine the dynamics of a system
	Value of the mapping comes from the **creation and shared analysis of the maps**	Helps us to understand deeply **ingrained assumptions** about how the world works; shape our habits and minds	Reveals possible problems that the team needs to address in the strategy, but also an important disconnect between the intermediate **indicators and long term goals**	Show causal relationship and **illustrates circular feedback**
		Developing an **image of an organizational structure**, a problem area, or the future, we gain insight into how our organization operates and what it will take to change	Account the important **feedback affects**	Helps show reinforcing loops: **compound change** in one direction with more change in the other direction
		Trust that the resulting shifts in power will be of benefit to the organization	Surfacing a team's **assumptions**	
		Patterns are trends or changes in events over time	**Focus the group conversation** on the most critical strategic issues or questions, **facilitation methodology**	

CHAPTER V - Conclusion

As indicated by Table 3: Alignment of Systems Thinking Tools and Organizational Change Process Challenges, there are many common characteristics between the challenges encountered during the initial stage of organizational change and selected systems thinking tools. In the case of two challenges, time and relevance, there is clearly a best match with a specific tool. Both the challenges of time and relevance have the greatest number of matching characteristics with the Causal Loop Diagram tool. For the challenge of time, the least alignment is noted between two systems thinking tools, The Iceberg and Action-to-Outcome. In the case of the challenge of relevance, the Behavior Over Time tool has the fewest aligned characteristics.

The number of aligned characteristics for each tool relative to the help challenge is low across all the tools. This is a unique situation among all the challenges. The systems thinking tools, Behavior Over Time, The Iceberg, and Casual Loop Diagram all have four matching characteristics, while the Action-to-Outcome tool only has three.

For the challenge walking the talk, two of the tools have the same high number of aligned characteristics while the remaining two tools have much lower numbers of aligned characteristics. The Iceberg and the Causal Loop Diagram tools both have seven characteristics in common with the challenge, while Action-to-Outcome only has five and Behavior Over Time graph has even fewer with four.

A summary of these results can be seen in Table 4: Number of Aligned Systems Thinking Tools Characteristics and Organizational Change Challenges Characteristics.

Table 4: Number of Aligned Systems Thinking Tools Characteristics and Organizational Change Challenges Characteristics

	Behavior Over Time	The Iceberg	Causal Loop Diagram	Action-to-Outcome
Time	6	4	7	4
Help	4	4	4	3
Relevance	5	7	8	7
Walking the talk	4	7	7	5

In reviewing the trends in the data, the specific alignments between challenges of organizational change and the systems thinking tools appear to be consistent with general statements in the literature.

Overcoming the challenge of time requires understanding the processes in the organization and having the ability to differentiate between necessary and unnecessary tasks that individuals may be performing daily (Senge, 1999). The systems thinking tool that has the greatest number of aligned characteristics is Causal Loop Diagram, which can be used to graphically depict how processes affect one another ("Basic," 2004). By using a graphical representation of the processes and their interactions, the task of deciphering necessary tasks from unnecessary tasks can be less daunting.

To overcome the challenge of help, it is important to perform a skills assessment to understand to what degree the capabilities for creating lasting organizational change exist

within the company (Senge, 1999). If the expertise is not available from within the company, then it is best to look to an external resource, such as a consultant. The limited number of aligned characteristics across all tools for this challenge can be explained by the fact that none of the tools involves a skills assessment. The characteristics where alignment is found are related to understanding the mindset of the organizational change team, which is a by-product of using any of the systems thinking tools. While understanding mindset is important in helping to understand any resistance that may be encountered when trying to gain support for bringing in outside help, the tools are not able to assist with the initial skills assessment.

Addressing the challenge of relevance requires an in depth understanding of the internal and external variables that are driving the need for change in the organization and the ability to communicate this to the larger organization (Senge, 1999). Causal Loop Diagrams can help an organization form this understanding by showing how variables affect one another ("Basic," 2004). Having a clear picture of the cause and effect of variables allows an organizational leader to convey the need for change.

The Iceberg also has a high number of aligned characteristics with the challenge of relevance. This makes sense as The Iceberg provides a formalized structure that can be used to help communicate how current events can be traced to the underlying structures and can be used to help drive decisions from a systems perspective (Kim, 1999).

Relevance is the only challenge with which the Action-to-Outcome tool is significantly aligned. This can be attributed to the need, when facing this challenge, to be able to convey the big picture. This big picture must include not only information on the current forces pushing for the change but also the ability to convey the impact of the proposed changes. By providing a means to identify indicators, feedback loops, mental models and external forces the Action-to-Outcome tool can be used to evaluate the potential outcomes of an action or set of actions (Jones, and Seville, March 2003).

The final challenge during the initial stage of organizational change is walking the talk. A large part of addressing this challenge involves not only communicating the need for change but also supporting the change by setting an example. While there is no tool that can teach an organizational leader to lead by example, the tools with the greatest number of aligned characteristics are those that provide a good understanding of the big picture. These tools are Causal Loop Diagrams and The Iceberg, both of which are efficient at helping an organizational leader develop a good understanding of the current situation and providing a structure in which to communicate the need for change.

This study is by no means exhaustive, and leaves many challenges and systems thinking tools yet to be examined. Yet the findings indicate that the method of comparing the characteristics of a specific challenge with those of a systems thinking tool can be used to evaluate the effectiveness of using the tool to help understand and overcome the challenge. Additionally, by focusing on the initial challenges of organizational change and the basic tools of systems thinking, this paper can provide organizational change

leaders with a starting point as they initiate an organizational change. The focus on basic tools also works to introduce systems thinking to organizational leaders and provides examples of practical and valid uses for the tools.

APPENDICES

Appendix A - Definitions

Action-to-Outcome Method - A systems thinking tool that can be used to identify indicators, feedback loops, mental models and external forces; used to evaluate the potential outcomes of an action or set of actions (Jones, and Seville, March 2003).

Behavior Over Time Graph (BOT) - A systems thinking tool that can be used to depict patterns of behavior to explore from a systems thinking perspective ("Basic," 2004).

Causal Loop Diagram (CLD) - A systems thinking tool that can be used to show how variables affects one another ("Basic," 2004).

Lifecycle - A lifecycle identifies the phases a product goes through from conception to obsolescence.

Organizational Change - A change that is organization-wide, as opposed to smaller changes such as adding a new person or modifying a program. Examples of organization-wide change include a change in mission, restructuring operations, or introduction of a new technology. Often this term designates a fundamental and radical reorientation in the way the organization operates (McNamara, 1999b).

Organizational Change Leader - Leaders exist at all levels of an organization. Organizational leaders are individuals tasked with implementing "organizational change" (Kotter, 1998).

Systems Thinking - "Systems thinking is an approach for developing models to promote our understanding of events, patterns of behavior resulting in the events, and even more importantly, the underlying structure responsible for the patterns of behavior" (Bellinger, 2004, para.1).

Systems Thinking Tools - System thinking tools focus on how the thing being studied interacts with the larger system and its components (Aronson, 2003).

The Iceberg - Visual representation of the three levels, events, pattern, and systemic structures that can be used to help drive decisions from a systems perspective (Kim, 1999).

Appendix B – Initial Organizational Challenge Characteristic List

Table B-1: Challenge of Time Characteristic List			
The Dance of Change, Senge (1999)	Basic Context for Organizational Change, McNamara (1999)	Winning at Change, Kotter (1998)	Creating Change, Senge and Kaeufer (2000)
• A **lack of flexibility** in scheduling and managing time • Time restraints can be a expressed as a **limits-to-growth** • Benefits from an **investment in learning initiatives** • If time invested is low, then **time scarcity** will limit project growth by 1) "time invested in the initiative will be **ineffective**," 2) "people will be **unwilling to commit** in the first place." This is a limiting process • Leverage lies in **investigating the** tacit assumptions and attitudes that underlie the lack of time flexibility • Benefits from i**ntegrating initiatives** and building capabilities for **eliminating busy work** • **Schedule time** for focus and concentration, value **unstructured time**, experiment with time • Trust people to **control their own use of time** • **Say no** to political games and non-essential demands	• Organizational change will **take longer than you think**	• Establish a **sense of urgency** • **Do not declare victor**y before the war is over • Manage and operate in **multiple timelines / timeframes** • Recognize that **time is a strategic resource** • Plan for and create **short term wins**, balance these short term results with **long term vision** for sustained success • Defining a vision of the future does **not happen according to a timetable or flowchart** • Day to day demands inevitably pull people in different directions, help people make **appropriate trade-offs**	• **Integrate initiatives** and set a focus and **eliminate unnecessary work** • Trust people to **control their time** • Value unstructured **time for reflection, dialogue, discussion, practice, and learning** • **Say no** to political game playing

Table B-2: Challenge of Help Characteristic List			
The Dance of Change, Senge (1999)	Basic Context for Organizational Change, McNamara (1999)	Winning at Change, Kotter (1998)	Creating Change, Senge and Kaeufer (2000)
• "I can do it myself" **attitude** • **Perception** that asking for help is a sign of incompetence • Managers **unaware** they need help • The stronger the profound change growth process the greater the requirements for **coaching, guidance, and support** • Building **self-awareness**, on both and individual and team level • **Gap** between the group's current performance and its aspirations • **Feelings and attitudes** may make it difficult to accept help • **Invest early** in help • Create capacity for **coaching** • Find a **partner** • **Understand attitudes** about seeking help	• Many doubt there are **effective means** to accomplish major organizational change • Consider using a **consultant**	• Build a **guiding coalition** • Engage the **right talent** • Assemble the **necessary skills, experience, and chemistry** • Work with **people outside** your organization • Working as a **team,** not just a collection of individuals	• **Investigate** the need for help early • Create internal **capacity for coaching** into line managers responsibilities • Find **partners** who can counsel one another

Table B-3: Challenge of Relevance Characteristic List			
The Dance of Change, Senge (1999)	Basic Context for Organizational Change, McNamara (1999)	Winning at Change, Kotter (1998)	Creating Change, Senge and Kaeufer (2000)
• **Establish relevance** • **Failure to develop a compelling business case** for change precludes any significant momentum from developing • Many never feel deeply committed, they are unclear **how it would impact the business** • Establish a clear strategy **behind the initiative by** establishing a **clear, authentic, convincing story** about the relevance of a change initiative • Tie initiatives to the **big picture**, employees and customer needs, and the business's long-term health • **Commitment** is a basic requirement for starting a change initiative • Focus on key business needs, how they fit in, if these needs are met or not • If a commitment **gap** develops people will not participate fully • Underlying limit or constraint behind this challenge is management's ability to **communicate** a clear business case for change • Potential **long delays** before business results improve can be discouraging • Requires a critical number of **leaders** • Strong level of **trust** among pilot group members develop with **shared vision exercises** • Explicitly raise **questions of relevance** in pilot groups and revisit relevance periodically • Make **information** available to pilot group members • Keep **training** linked tightly to business results • Inquire openly about **perceptions** that some people are getting carried away	• Change should not be done for the sake of change - it's a **strategy to accomplish some overall goal** • Increased and sustained **communications and education** • Widely communicate the **need for change**	• Identify every possible **variable that contributes** to complacency; brainstorm specific ways to **counter each variable** • **Communicate** the vision	• Build **awareness** among team leaders • Raise questions of **relevancy** in the group • Make more **information available** to members • Link **training** tightly to business results • Make sure that people who become enthusiastic **don't alienate others**

Table B-4: Challenge of Walking the Talk Characteristic List			
The Dance of Change, Senge (1999)	Basic Context for Organizational Change, McNamara (1999)	Winning at Change, Kotter (1998)	Creating Change, Senge and Kaeufer (2000)
• Need for individuals **take responsibility** for changes and new ways of operating • **Business as usual** is how the challenge perpetuates itself, insidiously and unseen, masked by complacency, resignation, and taken-for-granted political games-playing • Managers committed to change must be prepared to work through a thick layer of **cynicism** • Assumptions will only change gradually, through **reflection, experimentation, and example** • **Limiting process**: trust required increases and the previously taken-for-granted low trust becomes an issue • Need **credible and authentic advocates**, the credibility of the initiative will benefit • Underlying limit is the **clarity and credibility** • Reflection **gap** develops if people do not become more reflective • The **trust gap** influences whether or not there is a **reflection gap** • Encourage **reflective depth** at work • Develop espoused **aims and values** that are credible in terms of the **living quality of the organization** • Requires a **shared understanding** of what the company stands for build the credibility by **demonstration,** not by articulation • Work with **partners,** a partner is someone with whom we can speak openly and challenge our thinking • Cultivate **patience** under pressure • **Reflect on values** and think carefully about your **beliefs** about people • Develop a greater sense of **organizational awareness** • Make room to talk about **individual's values** • Practice shuttle **diplomacy**	• Provoke organization-wide change when a new chief executive's new and unique **personality pervades** the entire organizations • People think things are already **just fine** • Many are inherently **cynical about change** • Organization-wide change often goes against the very **values** held dear by members • Involve top management • Get as much **feedback** as practical • **Delegate** decisions • **Keep perspective**	• Can not write a memo instead of l**ighting a fire** • Talking too much and **saying too little** • **Align behaviors** on the part of senior executives - **lead by example** • **Create a vision** • Leaders must **win the support** of employees, partners, investors, and regulators • Grow the **coalition** strategically • Show a **genuine** care for individuals but a tough-mindedness about results • **Leading by example** is essential to **communicating a vision** • Quest for **learning** • Willingness to **push themselves** out of their own comfort zones • **Take risks** • **Empower others** to act on the vision	• Develop **aims and values** that are credible • Build credibility by **demonstration** not articulation • Work with **partners** who help you see how your behavior may communicate unintended messages • Develop **patience** under pressure

Appendix C – Initial Systems Thinking Tools Characteristic List

Table C-1: Behavior Over Time Graphs Characteristic List

Why Use Behavior-Over-Time graphs, Lynesis (n.d.)	Tips for Behavior-Over-Time graphs, Catalina (1997)	Getting Started with Behavior Over Time Graphs Richardson and Lyneis (1998)	Foundation Dynamics Sustainability Institute (2001)	Everyday Behavior Over Time Graphs, Stamell and Lyneis, (2001)
• Easy to **learn and use** • Medium to **formulate thoughts** more carefully and broadly and express them • Forces **explicitness** • Begin to **focus on change** rather than focusing on static events • Look at the change itself, and what is causing it, the **underlying system structure** • **Watch events** unfold • **Understanding** of the issue and team members perception of it • See **patterns and relationships** • Recognize **exponential growth** • Understand what happens if you **change the behavior of the variables** • Analyze until you **understand how the system works** • **Engaged learning** • **Precise thinking**	• Means to observe how a **variable changes over time** • Should not include qualitative words • Map multiple variable on graph, variables can be compared for possible **interdependencies and causal relationships** • **Different interpretations** of the stated variables are definitely possible • **Discussion** of the differences should take place • Discussion of when and **where a trend or pattern of behavior starts, ends, or changes** direction is recommended	• Focus on **patterns of change** over time rather then on single event • Engaging work and **lively discussions** • Think more deeply about what is happening and why and the underlying causes of changes **focus on patterns of change rather than on isolated events or little details** • Another way to **express and communicate ideas** • Prepare people for further work in system dynamic thinking and **develop dynamic thinking skills** • Easy to start • Does not require that variable can be measured in conventional units **soft variables** can be examined • Soft variable require **discussion to set scale** • Used to **plot and explore** any change • Requires **no special equipment** • Avoid getting stuck in **too much detail** • **Brainstorm** list of changes • Focus discussion on **variables that are the most important and central** to the issue • Used to learn more and **understand more about an issue** • Work **individually or in groups** • Understand **why changes are important** • Understand if **variables are related** • How parts of the **system fit together,** think about what causes them • **Be specific** • **Support by management** (conducting BOT) • Helps to have someone with whom to **discuss ideas and obstacles** (planning BOT session) • **Willingness to make mistakes,** start over • Requires **time to think** • Looking for **different view** on the same variable	• Help break the **pattern** • Identify **leverage points** • Identify what interacts with **different parts of the system** • Understand difficult **delayed dynamics** • Understand what **unforeseeable non-linearity in the system** could lead the action to be tripped up • Start with **multiple theories** to explain issue • Explore **systemic structure and mindset** described in theories • Theories should describe **different views** on what drives the patterns of behavior and events • Value of the mapping comes from the **creation and shared analysis of the maps**	• **Broaden and sharpen thinking** about changes over time • Line graph that shows a **pattern of change over time** • Variable is a quantity that can **increase or decrease with time** • Be sure everyone has the **same understanding of what labels** mean • Focus on patterns of behavior **not particular details** • **Rate** at which something is changing • Ask why and **make predictions** • Draw **related variables** on the same graph • Graphs can have **many right answers** • Use to **examine patterns of behavior and their causes** • **Broaden our thinking** • **Big picture** • Another way to **express and defend ideas** • Make **predictions,** express what they think will happen to a variable in the future • Generate **hypotheses** • Express **alternatives** • Produces graphs as **output to interpret**

Table C-2: The Iceberg Characteristic List				
How to find Structure, Katash (1996)	Why is Change so Hard? Theories and thoughts about organizational change process, Hohn (1998)	Systems Thinking: What, Why, When, Where, and How?, Goodman (1997)	System Behavior and Causal Loop Diagrams, Kirkwood (n.d.)	Systems Thinking Basics From Concepts to Causal Loops, Anderson and Johnson (1997)
• **Story telling** in a group • A simple three level diagram used to differentiate **events, patterns, and structures** • Encourage looking more deeply for the **underlying structure** to help understand what's going on and why • **Causal connection** • **Mental models**, these are an even deeper kind of structure • **Structure is the network of relationships of things**, not the things themselves • Showing **different ways of seeing the world** • Noticing **causal connections** • Distinguish between **internal structure (mental models) and external structures (others)** • Notice not just the mental model, but also the **cause and effect linkages**	• Combination of **top-down and bottom-up strategies** • Seek to **close the gap** between current performance and an organizations potential • Synthetical thinking or **systems thinking** • Helps us to **understand deeply ingrained assumptions** about how the world works; shapes our habits and minds • Developing an **image of an organizational structure**, a problem area, or the future, we gain insight into how our organization operates and what it will take to change • First (level) iceberg appears, it is small and highly visible - the **logistics** • Logistics (first level) is not insignificant but can be addressed with **creative thinking** • Second (level) iceberg, way business is done or habit, contains **existing strategies;** if **operating norms** of a program are ones of isolation, authoritarianism, and mistrust, then the organization environment will be hostile to a participatory planning process • Third (level) iceberg is **mindset,** which embraces the many assumptions, beliefs, and **values** that underlie the behavior of programs and practitioners • Capabilities of the system as a whole or the **interrelationship of processes** especially as they **relate to the overall goals** • **Consensus building, participatory decision-making**, and all the other skills needed for teams to function effectively • **Participatory planning** process assumes internal motivation • **Trust** that the resulting shifts in power will be of benefit to the organization • Participatory planning process **shifts the power in the organization from top and spreads it throughout the organization**	• To get the **full story** out emphasize the iceberg framework • Group describe the problem from all **three angles**: event, patterns, and structure • Get **different perspectives** • **Framework to discuss patterns** and discover how different people see the same event	• Higher leverage for **lasting change** in the system structure (base of the iceberg) • The **internal structure** of the system is often the most important • **Events-causes-events orientation** (tip of the iceberg) doesn't lead to very powerful ways to alter the undesirable performance • Shift from this event orientation to focusing on the internal system structure, **you improve possibility of improving business performance**	• Systems are built on **structures** • Structure is the **overall way in which the system components are interrelated** -the organization of a system • If event focused you can only **react** to each new event rather than anticipate and shape them • Solutions designed at the **event level tend to be short lived** • Uncovering elusive systemic structure that drives events, you can begin **identifying higher-leverage actions** • **Patterns are trends or changes in events over time** • Detecting a pattern helps you put the most **recent event in the context** of other similar events • Thinking at the structural level means **thinking in terms of causal connections** • Structure holds the key to **lasting, high leverage change** • Actions taken at the structural level are creative, because they help you to **shape a different future**, the future that you want

Table C-3: Action-to-Outcome Characteristic List		
Action-To-Outcome Mapping: Testing Strategy with Systems Thinking, Jones and Seville (2003)	Action-to-Outcome Mapping: A Facilitation Method that Integrates Systems Thinking and Indicators Jones, Seville, Hamilton, Sawin, and Rice, 2003	Exploring Community Indicators with Systems Thinking Facilitation and Simulation Modeling Jones and Seville, n.d.
• **Action-oriented teams** • Working on a range of actions to achieve some **long term outcome** • **Implementing a policy** that they believe will have broad, positive effects • **Specific help** in addressing questions • Exploring the **existing causal theory; chain of cause and effect** • Adding **feedback** • Uncovering **critical mindsets** • Looking for **opportunities** • **Articulate actions and outcomes** and create a map connecting the two • Identify intermediate **indicators** that the group can use to measure process • Starting with simple one way **causal chain** • Identify important **reinforcing loops** that the group's actions may trigger • Ways that the **actions** may get amplified • Understanding how the **system can resist change or push back** on the group's effort through balancing loops • Reveals possible problems that the team needs to address in the strategy, but also an important disconnect between the **intermediate indicators and long term goals** • Address both **structure and mind sets** in way that reinforce each other • Think of the forces that may have impact on the outcome • Listing of **external forces**, while sobering, helps the group see how it's actions fit into a larger picture and prompts members to consider how they might influence any of the external factors • Identify potential **supporting actions**, new areas of focus, and areas for further exploration • Account for important **feedback affects** • Surfacing a team's **assumptions** • Maintaining a **focus on strategy**	• Focuses on strengthening **current strategy** • Interested in **building on an effort** where they've identified key indicators • **Facilitation methodology** to incorporate indicators and start where the group is • How **actions lead to goals** • How **system pushes back or amplifies efforts** • How **mindset slow or accelerate change** • How **external forces** push on outcomes • **Opportunities**	• **Indicator** projects • **Diverse teams** • Direct action based on the **data collection and analysis** • Where are the deep rooted **drivers** • What can we do to **change the future behavior** • Powerful **leverage points** • Focus the **group conversation** on the most critical strategic issues or questions • Build a **shared understanding** • Systemic **drivers of change** • Surface and test people's **assumptions** • **Incorporate data** and previous studies • **Create system maps**

Table C-4: Causal Loop Diagrams Characteristic List			
System Behavior and Causal Loop Diagrams, Kirkwood (n.d.)	So You Think You Want To Change Something, Bellinger (2004)	Tips for Causal Loop Diagrams (CLDs), Catalina Foothills School District (n.d.)	Systems Thinking Basics From Concepts to Causal Loops, Anderson and Johnson (1997)
• Understand the **system structures which cause the pattern of behavior** • **Shows relationships** among the elements • Presents relationships that are **difficult to verbally describe** because normal language presents interrelations in linear cause and effect chains • When an element of a **system indirectly influences itself** creates feedback or causal loop - closed sequence of cause and effects • It is often necessary to consider feedback within **management systems** to understand what is causing the patterns of behavior • Starting point for **analyzing what is causing a particular pattern of behavior**	• The way the situation is initially perceived is as a **balancing structure** in which the difference between the desired state and the current state creates a gap. A gap which activity is intended to reduce over time • Multiple actors within the system, each with their own perceptions of what the desired state should be. And each actor probably has **different perceptions** of what the current state actually is **developing a collective understanding** among the actors of a single perception of the current state, the desired state, and the appropriate action to move the current state towards the desired state • May be perceived that the effort necessary to **develop alignment** is an investment for which the necessary time and energy are not available, without that investment the attainment of the most appropriate end results is also sacrificed	• **Understand and communicate the interactions** that determine the dynamics of a system • Show **causal relationship** and illustrate circular feedback • Identify important CLDs by looking for **causal relationships** • Taking into account the **purpose and the audience** • Help you **tell a story** or express you interpretations or mental models of how a system works • All variables in a CLD must be able to **increase or decrease** • Indicate the **effect of the influence** • A CLD may be **reinforcing, and grow, or shrink until acted upon by a limiting force**, or balancing and more toward, return to, or oscillate around a particular condition • If there is significant amount of time between the action of one variable and the reaction of the next variable in the loop, a **time delay** can be indicated	• A **graphic depiction** of structure • Lets you e**xplore dynamic interrelationships** • **Hypothesize about solutions** to your problem and then test them • Like **simplified maps** of the connections in a closed loop system of cause and effect relationships • Reinforcing loops: **compound change in one direction** with more change in the other direction, see a steady upward or downward line, exponential upward or downward curve • Balancing loops: try to **bring things to a desired state** and keep them there, if certain conditions keep coming back to some kind of norm, no matter what anyone does • Resist change**:** if **growth falters** or never quite starts; **unproductive behavior never gets dropped** • Problems: **failure to take delays** into account, take too long to perceive feedback, measure results, decide how to respond to results, implement solutions • Describing their causal relationships can bring about **diversity of knowledge, perspective, and opinions within the group** • Exploring the **breadth of views** among team members

Appendix D – Organizational Change Challenges and Systems Thinking Tools Characteristic Matrix

Table D-1: Challenge of Time and Behavior Over Time Tool Matrix

		Behavior Over Time																										
		Easy to learn and use	Medium to **formulate thoughts more carefully and broadly and express them**	Forces **explicitness**	Begin to **focus on change** over time rather than focusing on static events	Look at the change itself, and what is causing it, the **underlying system structure and mindset**	Understanding of the issue and **team members perception** of it; different interpretations of the stated variables are definitely possible	Recognize **exponential growth**	Understand what happens if you change the **behavior of the variables over time**	Should not include **qualitative** words	Map multiple variable on graph; variables can be compared for possible **interdependencies and causal relationships**	Engaging work and lively **discussions**	Prepare people for further work in system dynamic thinking and **develop dynamic thinking skills**	Does not require that variable can be measured in conventional units **soft variables** can be examined	Focus discussion on variables that are the most **important and central to the issue**	Work **individually or in groups**	Support by **management** (conducting BOT)	Helps to have **someone with whom to discuss ideas and obstacles** (planning BOT session)	**Willingness to make mistakes**, start over	Requires **time to think**	Identify **leverage points**	Understand difficult **delayed dynamics**	Value of the mapping comes from the **creation and shared analysis of the maps**	Use to examine **patterns of behavior and their causes**	**Big picture**	**Generate hypotheses**
Time	Benefits from an investment in **learning initiatives**													X														
	If time invested is low, then time scarcity will limit project growth by 1) "time invested in the initiative will be ineffective," 2) "people will be unwilling to commit in the first place" this is a **limiting process**				X																							
	Leverage lies in **investigating the tacit assumptions and attitudes** that underlie the lack of time flexibility						X																					
	Schedule **time for focus** and concentration, value unstructured time, experiment with time; reflection, dialogue, discussion, practice, and learning																			X								
	Trust people to control their own use of time																											
	Say no to political games and nonessential demands																											
	Establish a **sense of urgency**, organizational change will take longer than you think																											
	Recognize that **time is a strategic resource;** manage and operate in multiple timelines / timeframes														X													
	Plan for and create short term wins; **balance these short term results with long term vision** for sustained success, do not declare victory before the war is over																											
	Integrate initiatives, set a focus, build capabilities for eliminating busy work, and help people make appropriate trade-offs										X																	

Table D-2: Challenge of Time and The Iceberg Matrix

		The Iceberg														
		Story telling in a group	A simple three level diagram used to **differentiate events, patterns, and structures**	Encourage looking more deeply for the **underlying structure** to help understand what's going on and why; begin identifying higher-leverage actions	**Causal connection**	**Mental models**, these are an even deeper kind of structure, showing different ways of seeing the world	Combination of **top-down and bottom-up strategies**	Seek to **close the gap between current performance and an organizations potential**	Helps us to understand deeply **ingrained assumptions** about how the world works; shape our habits and minds	Developing an **image of an organizational structure**, a problem area, or the future, we gain insight into how our organization operates and what it will take to change	Capabilities of the system as a whole or the interrelationship of processes especially as they relate to the **overall goals**	Consensus building, **participatory decision-making**, and all the other skills needed for teams to function effectively	**Trust** that the resulting shifts in power will be of benefit to the organization	**Shift from this event orientation** to focusing on the internal system structure, you improve possibility of improving business performance	**Patterns** are trends or changes in events over time
Time	Benefits from an investment in **learning initiatives**															
	If time invested is low, then time scarcity will limit project growth by 1) "time invested in the initiative will be ineffective," 2) "people will be unwilling to commit in the first place" this is a **limiting process**							X								
	Leverage lies in **investigating the tacit assumptions and attitudes** that underlie the lack of time flexibility								X							
	Schedule **time for focus** and concentration, value unstructured time, experiment with time; reflection, dialogue, discussion, practice, and learning															
	Trust people to control their own use of time															
	Say no to political games and nonessential demands											X				
	Establish a **sense of urgency**, organizational change will take longer than you think															
	Recognize that **time is a strategic resource**; manage and operate in multiple timelines / timeframes															
	Plan for and create short term wins; **balance these short term results with long term vision** for sustained success, do not declare victory before the war is over										X					
	Integrate initiatives, set a focus, build capabilities for eliminating busy work, and help people make appropriate trade-offs															

Table D-3: Challenge of Time and Casual Loop Diagram Matrix

		Casual Loop Diagram																		
		Diverse action-oriented teams	**Specific help in addressing questions**	Exploring the existing causal theory; **chain of cause and effect**	Uncovering **critical mindsets**	Looking for **opportunities**	Identify **intermediate indicators** that the group can use to measure process	Identify important **reinforcing loops** that the group's actions may trigger	Ways that the **actions may get amplified** and lead to goals	Understanding how the system can resist change or push back on the group's effort through **balancing loops**	Reveals possible problems that the team needs to address in the strategy, but also an important disconnect between the intermediate **indicators and long term goals**	Listing of **external forces**, while sobering, helps the group see how it's actions fit into a larger picture and prompts members to consider how they might influence any of the external factors	**Identify potential** supporting actions, new areas of focus, and areas for further exploration	Account the important **feedback affects**	Surfacing a team's **assumptions**	Maintaining a focus on **strategy**	Direct action based on the **data collection and analysis**	**Focus the group conversation** on the most critical strategic issues or questions, **facilitation methodology**	Identify systemic **drivers of change and leverage points**
Time	Benefits from an investment in **learning initiatives**																			
	If time invested is low, then time scarcity will limit project growth by 1) "time invested in the initiative will be ineffective," 2) "people will be unwilling to commit in the first place" this is a **limiting process**							X												
	Leverage lies in **investigating the tacit assumptions and attitudes** that underlie the lack of time flexibility														X					
	Schedule **time for focus** and concentration, value unstructured time, experiment with time; reflection, dialogue, discussion, practice, and learning																			
	Trust people to control their own use of time	X																		
	Say no to political games and nonessential demands																			
	Establish a **sense of urgency**, organizational change will take longer than you think																		X	
	Recognize that **time is a strategic resource**; manage and operate in multiple timelines / timeframes															X				
	Plan for and create short term wins; **balance these short term results with long term vision** for sustained success, do not declare victory before the war is over										X									
	Integrate initiatives, set a focus, build capabilities for eliminating busy work, and help people make appropriate trade-offs												X							

Table D-4: Challenge of Time and Action-to-Outcome Matrix

		Action-to-Outcome																
		Understand the system structures which **cause the pattern of behavior**	**Graphically presents relationships** that are difficult to verbally describe	It is often necessary to consider **feedback within management systems** to understand what is causing the patterns of behavior	Starting point for analyzing what is causing a **particular pattern of behavior**	Helps to show **balancing structures** in which the difference between the desired state and the current state creates a **gap**	Multiple actors within the system, each with their own **perceptions** of what the desired state should be	Develop a **collective understanding taking into account the purpose and the audience**	May be perceived that the effort necessary to **develop alignment is an investment** for which the necessary **time and energy** are not available	Understand and **communicate the interactions** that determine the dynamics of a system	Show causal relationship and **illustrates circular feedback**	Help you **tell a story or express you interpretations or mental models** of how a system works	Indicate the **effect of the influence**	If there is significant amount of time between the action of one variable and the reaction of the next variable in the loop, a **time delay** can be indicated	**Hypothesize** about solutions to your problem and then test them	Helps show reinforcing loops: **compound change** in one direction with more change in the other direction	Helps identify resist change: **if growth falters or never quite starts; unproductive behavior never gets dropped**
Time	Benefits from an investment in **learning initiatives**																	
	If time invested is low, then time scarcity will limit project growth by 1) "time invested in the initiative will be ineffective," 2) "people will be unwilling to commit in the first place" this is a **limiting process**				X													
	Leverage lies in **investigating the tacit assumptions and attitudes** that underlie the lack of time flexibility																	
	Schedule **time for focus** and concentration, value unstructured time, experiment with time; reflection, dialogue, discussion, practice, and learning																	
	Trust people to control their own use of time																	
	Say no to political games and nonessential demands			X														
	Establish a **sense of urgency**, organizational change will take longer than you think																	
	Recognize that **time is a strategic resource**; manage and operate in multiple timelines / timeframes								X									
	Plan for and create short term wins; **balance these short term results with long term vision** for sustained success, do not declare victory before the war is over					X												
	Integrate initiatives, set a focus, build capabilities for eliminating busy work, and help people make appropriate trade-offs																	

Table D-5: Challenge of Help and Behavior Over Time Tool Matrix

		Behavior Over Time																								
		Easy to learn and use	Medium to **formulate thoughts more carefully and broadly and express them**	Forces **explicitness**	Begin to **focus on change** over time rather than focusing on static events	Look at the change itself, and what is causing it, the **underlying system structure and mindset**	Understanding of the issue and **team members perception** of it; different interpretations of the stated variables are definitely possible	Recognize **exponential growth**	Understand what happens if you change the **behavior of the variables over time**	Should not include **qualitative** words	Map multiple variable on graph; variables can be compared for possible **interdependencies and causal relationships**	Engaging work and lively **discussions**	Prepare people for further work in system dynamic thinking and **develop dynamic thinking skills**	Does not require that variable can be measured in conventional units **soft variables** can be examined	Focus discussion on variables that are the most **important and central to the issue**	Work **individually or in groups**	Support by **management** (conducting BOT)	Helps to have **someone with whom to discuss ideas and obstacles** (planning BOT session)	**Willingness to make mistakes**, start over	Requires **time to think**	Identify **leverage points**	Understand difficult **delayed dynamics**	Value of the mapping comes from the **creation and shared analysis of the maps**	Use to examine **patterns of behavior and their causes**	**Big picture**	**Generate hypotheses**
Help	Building **self-awareness**, on both and individual and team level.																									
	Gap between the group's current performance and its aspirations					X																				
	Understand **attitudes** about seeking help						X																			
	Doubt that there are **effective means** to accomplish major organizational change																									
	Build a **guiding coalition**															X										
	Work with people outside your organization, consider using a **consultant**																									
	Work as a **team,** not just a collection of individuals						X																			
	Investigate the **need for help** early and invest early																									
	Create **internal capacity for coaching** into line managers responsibilities																									
	Find **partners** who can counsel one another																	X								

Table D-6: Challenge of Help and The Iceberg Matrix

		The Iceberg														
		Story telling in a group	A simple three level diagram used to **differentiate events, patterns, and structures**	Encourage looking more deeply for the **underlying structure** to help understand what's going on and why; begin identifying higher-leverage actions	**Causal connection**	**Mental models**, these are an even deeper kind of structure, showing different ways of seeing the world	Combination of **top-down and bottom-up strategies**	Seek to **close the gap between current performance and an organizations potential**	Helps us to understand deeply **ingrained assumptions** about how the world works; shape our habits and minds	Developing an **image of an organizational structure**, a problem area, or the future, we gain insight into how our organization operates and what it will take to change	Capabilities of the system as a whole or the interrelationship of processes especially as they relate to the **overall goals**	Consensus building, **participatory decision-making**, and all the other skills needed for teams to function effectively	**Trust** that the resulting shifts in power will be of benefit to the organization	**Shift from this event orientation** to focusing on the internal system structure, you improve possibility of improving business performance	**Patterns** are trends or changes in events over time
Help	Building **self-awareness**, on both and individual and team level					X									
	Gap between the group's current performance and its aspirations							X							
	Understand **attitudes** about seeking help								X						
	Doubt that there are **effective means** to accomplish major organizational change						X								
	Build a **guiding coalition**														
	Work with people outside your organization, consider using a **consultant**														
	Work as a **team,** not just a collection of individuals														
	Investigate the **need for help** early and invest early														
	Create **internal capacity for coaching** into line managers responsibilities														
	Find **partners** who can counsel one another														

Table D-7: Challenge of Help and Casual Loop Diagram Matrix

		Casual Loop Diagram																		
		Diverse action-oriented teams	**Specific help in addressing questions**	Exploring the existing causal theory; **chain of cause and effect**	Uncovering **critical mindsets**	Looking for **opportunities**	Identify **intermediate indicators** that the group can use to measure process	Identify important **reinforcing loops** that the group's actions may trigger	Ways that the **actions may get amplified** and lead to goals	Understanding how the system can resist change or push back on the group's effort through **balancing loops**	Reveals possible problems that the team needs to address in the strategy, but also an important disconnect between the intermediate **indicators and long term goals**	Listing of **external forces**, while sobering, helps the group see how it's actions fit into a larger picture and prompts members to consider how they might influence any of the external factors	**Identify potential** supporting actions, new areas of focus, and areas for further exploration	Account the important **feedback affects**	Surfacing a team's **assumptions**	Maintaining a focus on **strategy**	Direct action based on the **data collection and analysis**	**Focus the group conversation** on the most critical strategic issues or questions, **facilitation methodology**	Identify systemic **drivers of change and leverage points**
Help	Building **self-awareness**, on both and individual and team level																			
	Gap between the group's current performance and its aspirations								X											
	Understand **attitudes** about seeking help				X															
	Doubt that there are **effective means** to accomplish major organizational change																			X
	Build a **guiding coalition**																		X	
	Work with people outside your organization, consider using a **consultant**																			
	Work as a **team,** not just a collection of individuals																		X	
	Investigate the **need for help** early and invest early																			
	Create **internal capacity for coaching** into line managers responsibilities																			
	Find **partners** who can counsel one another																			

Table D-8: Challenge of Help and Action-to-Outcome Matrix

		Action-to-Outcome																
		Understand the system structures which **cause the pattern of behavior**	**Graphically presents relationships** that are difficult to verbally describe	It is often necessary to consider **feedback within management systems** to understand what is causing the patterns of behavior	Starting point for analyzing what is causing a **particular pattern of behavior**	Helps to show **balancing structures** in which the difference between the desired state and the current state creates a **gap**	Multiple actors within the system, each with their own **perceptions** of what the desired state should be	Develop a **collective understanding taking into account the purpose and the audience**	May be perceived that the effort necessary to **develop alignment is an investment** for which the necessary **time and energy** are not available	Understand and **communicate the interactions** that determine the dynamics of a system	Show causal relationship and **illustrates circular feedback**	Help you **tell a story or express you interpretations or mental models** of how a system works	Indicate the **effect of the influence**	If there is significant amount of time between the action of one variable and the reaction of the next variable in the loop, a **time delay** can be indicated	**Hypothesize** about solutions to your problem and then test them	Helps show reinforcing loops: **compound change** in one direction with more change in the other direction	Helps identify resist change: **if growth falters or never quite starts; unproductive behavior never gets dropped**
Help	Building **self-awareness**, on both and individual and team level																	
	Gap between the group's current performance and its aspirations									X								
	Understand **attitudes** about seeking help																	
	Doubt that there are **effective means** to accomplish major organizational change							X										
	Build a **guiding coalition**						X											
	Work with people outside your organization, consider using a **consultant**																	
	Work as a **team,** not just a collection of individuals						X											
	Investigate the **need for help** early and invest early																	
	Create **internal capacity for coaching** into line managers responsibilities																	
	Find **partners** who can counsel one another																	

Table D-9: Challenge of Relevance and Behavior Over Time Tool Matrix

		Behavior Over Time																											
		Easy to learn and use	Medium to **formulate thoughts more carefully and broadly and express them**	Forces **explicitness**	Begin to **focus on change** over time rather than focusing on static events	Look at the change itself, and what is causing it, the **underlying system structure and mindset**	Understanding of the issue and **team members perception** of it; different interpretations of the stated variables are definitely possible	Recognize **exponential growth**	Understand what happens if you change the **behavior of the variables over time**	Should not include **qualitative** words	Map multiple variable on graph; variables can be compared for possible **interdependencies and causal relationships**	Engaging work and lively **discussions**	Prepare people for further work in system dynamic thinking and **develop dynamic thinking skills**	Does not require that variable can be measured in conventional units **soft variables** can be examined	Focus discussion on variables that are the most **important and central to the issue**	Work **individually or in groups**	Support by **management** (conducting BOT)	Helps to have **someone with whom to discuss ideas and obstacles** (planning BOT session)	**Willingness to make mistakes**, start over	Requires **time to think**	Identify **leverage points**	Understand difficult **delayed dynamics**	Value of the mapping comes from the **creation and shared analysis of the maps**	Use to examine **patterns of behavior and their causes**	**Big picture**	**Generate hypotheses**
Relevance	Failure to **develop a compelling business case** for change precludes any significant momentum from developing		X																									
	Establish a clear strategy behind the initiative by establishing a **clear, authentic, convincing story about the relevance** of a change initiative																											
	Tie initiatives to the **big picture**, business and customer needs, and the business's long-term health																									X		
	If a **commitment gap** develops people will not participate fully																											
	Underlying limit or constraint behind this challenge is management's ability to widely **communicate a clear business case** for change														X													
	Potential **long delays** before business results improve can be discouraging																					X						
	Requires a **critical number of leaders**																											
	Strong level of **trust** among pilot group members develop with **shared vision** exercises																											
	Explicitly **raise questions of relevance** in pilot groups and revisit relevance periodically																											
	Make **information** available to pilot group members																											
	Keep training linked tightly to **business results**																											
	Increased and sustained **communications and education on the vision**		X																									
	Identify every possible v**ariable that contributes to complacency;** brainstorm specific ways to counter each variable																											
	Build awareness among team leaders																											
	Make sure that people who become **enthusiastic don't alienate others**																											

Table D-10: Challenge of Relevance and The Iceberg Matrix

		The Iceberg														
		Story telling in a group	A simple three level diagram used to **differentiate events, patterns, and structures**	Encourage looking more deeply for the **underlying structure** to help understand what's going on and why; begin identifying higher-leverage actions	**Causal connection**	**Mental models**, these are an even deeper kind of structure, showing different ways of seeing the world	Combination of **top-down and bottom-up strategies**	Seek to **close the gap between current performance and an organizations potential**	Helps us to understand deeply **ingrained assumptions** about how the world works; shape our habits and minds	Developing an **image of an organizational structure**, a problem area, or the future, we gain insight into how our organization operates and what it will take to change	Capabilities of the system as a whole or the interrelationship of processes especially as they relate to the **overall goals**	Consensus building, **participatory decision-making**, and all the other skills needed for teams to function effectively	**Trust** that the resulting shifts in power will be of benefit to the organization	**Shift from this event orientation** to focusing on the internal system structure, you improve possibility of improving business performance	**Patterns** are trends or changes in events over time
Relevance	Failure to **develop a compelling business case** for change precludes any significant momentum from developing									X					
	Establish a clear strategy behind the initiative by establishing a **clear, authentic, convincing story about the relevance** of a change initiative	X													
	Tie initiatives to the **big picture**, business and customer needs, and the business's long-term health		X												
	If a **commitment gap** develops people will not participate fully											X			
	Underlying limit or constraint behind this challenge is management's ability to widely **communicate a clear business case** for change														
	Potential **long delays** before business results improve can be discouraging														
	Requires a **critical number of leaders**												X		
	Strong level of **trust** among pilot group members develop with **shared vision** exercises												X		
	Explicitly **raise questions of relevance** in pilot groups and revisit relevance periodically														
	Make **information** available to pilot group members														
	Keep training linked tightly to **business results**													X	
	Increased and sustained **communications and education on the vision**														
	Identify every possible v**ariable that contributes to complacency;** brainstorm specific ways to counter each variable			X											
	Build awareness among team leaders											X			
	Make sure that people who become **enthusiastic don't alienate others**														

Table D-11: Challenge of Relevance and Casual Loop Diagram Matrix

		Casual Loop Diagram																		
		Diverse action-oriented teams	**Specific help in addressing questions**	Exploring the existing causal theory; **chain of cause and effect**	Uncovering **critical mindsets**	Looking for **opportunities**	Identify **intermediate indicators** that the group can use to measure process	Identify important **reinforcing loops** that the group's actions may trigger	Ways that the **actions may get amplified** and lead to goals	Understanding how the system can resist change or push back on the group's effort through **balancing loops**	Reveals possible problems that the team needs to address in the strategy, but also an important disconnect between the intermediate **indicators and long term goals**	Listing of **external forces**, while sobering, helps the group see how it's actions fit into a larger picture and prompts members to consider how they might influence any of the external factors	**Identify potential** supporting actions, new areas of focus, and areas for further exploration	Account the important **feedback affects**	Surfacing a team's **assumptions**	Maintaining a focus on **strategy**	Direct action based on the **data collection and analysis**	**Focus the group conversation** on the most critical strategic issues or questions, **facilitation methodology**	Identify systemic **drivers of change and leverage points**
Relevance	Failure to **develop a compelling business case** for change precludes any significant momentum from developing																X		
	Establish a clear strategy behind the initiative by establishing a **clear, authentic, convincing story about the relevance** of a change initiative																		
	Tie initiatives to the **big picture**, business and customer needs, and the business's long-term health											X							
	If a **commitment gap** develops people will not participate fully																		
	Underlying limit or constraint behind this challenge is management's ability to widely **communicate a clear business case** for change																	X	
	Potential **long delays** before business results improve can be discouraging										X								
	Requires a **critical number of leaders**																		
	Strong level of **trust** among pilot group members develop with **shared vision** exercises																	X	
	Explicitly **raise questions of relevance** in pilot groups and revisit relevance periodically		X																
	Make **information** available to pilot group members																		
	Keep training linked tightly to **business results**						X												
	Increased and sustained **communications and education on the vision**																		
	Identify every possible v**ariable that contributes to complacency;** brainstorm specific ways to counter each variable			X															
	Build awareness among team leaders																	X	
	Make sure that people who become **enthusiastic don't alienate others**								X										

Table D-12: Challenge of Relevance and Action-to-Outcome Tool Matrix

		Action-to-Outcome																
		Understand the system structures which **cause the pattern of behavior**	**Graphically presents relationships** that are difficult to verbally describe	It is often necessary to consider **feedback within management systems** to understand what is causing the patterns of behavior	Starting point for analyzing what is causing a **particular pattern of behavior**	Helps to show **balancing structures** in which the difference between the desired state and the current state creates a **gap**	Multiple actors within the system, each with their own **perceptions** of what the desired state should be	Develop a **collective understanding taking into account the purpose and the audience**	May be perceived that the effort necessary to **develop alignment is an investment** for which the necessary **time and energy** are not available	Understand and **communicate the interactions** that determine the dynamics of a system	Show causal relationship and **illustrates circular feedback**	Help you **tell a story or express you interpretations or mental models** of how a system works	Indicate the **effect of the influence**	If there is significant amount of time between the action of one variable and the reaction of the next variable in the loop, a **time delay** can be indicated	**Hypothesize** about solutions to your problem and then test them	Helps show reinforcing loops: **compound change** in one direction with more change in the other direction	Helps identify resist change: **if growth falters or never quite starts; unproductive behavior never gets dropped**
Relevance	Failure to **develop a compelling business case** for change precludes any significant momentum from developing		X															
	Establish a clear strategy behind the initiative by establishing a **clear, authentic, convincing story about the relevance** of a change initiative											X						
	Tie initiatives to the **big picture**, business and customer needs, and the business's long-term health																	
	If a **commitment gap** develops people will not participate fully																	X
	Underlying limit or constraint behind this challenge is management's ability to widely **communicate a clear business case** for change									X								
	Potential **long delays** before business results improve can be discouraging													X				
	Requires a **critical number of leaders**																	
	Strong level of **trust** among pilot group members develop with **shared vision** exercises																	
	Explicitly **raise questions of relevance** in pilot groups and revisit relevance periodically	X																
	Make **information** available to pilot group members																	
	Keep training linked tightly to **business results**																	
	Increased and sustained **communications and education on the vision**											X						
	Identify every possible v**ariable that contributes to complacency;** brainstorm specific ways to counter each variable										X							
	Build awareness among team leaders																	
	Make sure that people who become **enthusiastic don't alienate others**																	

Table D-13: Challenge of Walking the talk and Behavior Over Time Tool Matrix

		Behavior Over Time Graphs																												
		Easy to learn and use	Medium to **formulate thoughts more carefully and broadly and express them**	Forces **explicitness**	Begin to **focus on change** over time rather than focusing on static events	Look at the change itself, and what is causing it, the **underlying system structure and mindset**	Understanding of the issue and **team members perception** of it; different interpretations of the stated variables are definitely possible	Recognize **exponential growth**	Understand what happens if you change the **behavior of the variables over time**	Should not include **qualitative** words	Map multiple variable on graph; variables can be compared for possible **interdependencies and causal relationships**	Engaging work and lively **discussions**	Prepare people for further work in system dynamic thinking and **develop dynamic thinking skills**	Does not require that variable can be measured in conventional units **soft variables** can be examined	Focus discussion on variables that are the most **important and central to the issue**	Work **individually or in groups**	Support by **management** (conducting BOT)	Helps to have **someone with whom to discuss ideas and obstacles** (planning BOT session)	**Willingness to make mistakes**, start over	Requires **time to think**	Identify **leverage points**	Understand difficult **delayed dynamics**	Value of the mapping comes from the **creation and shared analysis of the maps**	Use to examine **patterns of behavior and their causes**	**Big picture**	**Generate hypotheses**
Walking the talk	Need individuals to take responsibility for changes and new ways of operating; **empower others** to act on the vision																													
	Business as usual is how the challenge perpetuates itself, insidiously and unseen, masked by complacency, resignation, and taken-for-granted political games-playing																													
	Assumptions will only change gradually, through reflection, experimentation, and example; **reflection gap** develops if people do not become more reflective																													
	Limiting process, trust required increases and the previously taken-for-granted low trust becomes an issue, creating a **trust gap**													X																
	With **credible and authentic advocates**, the credibility of the initiative will benefit																													
	Requires a **shared understanding** of the values of company																							X						
	Build the credibility by demonstration, not by articulation; lead by example																													
	Work with **partners,** a partner is someone with whom we can speak openly and challenge our thinking																	X												
	Cultivate **patience under pressure**																													
	Reflect on values and think carefully about your **beliefs about people**																													
	Develop a greater sense of **organizational awareness**												X																	
	Many are **inherently cynical** about change																													
	Organization-wide change often goes against the very **values** held dear by members; keep perspective																													
	Get as much **feedback** as practical																													
	Align behaviors on the part of senior executives																													
	Leaders must **win the support** of employees, partners, investors, and regulators																													
	Willingness to push themselves out of their own comfort zones and take risks; **quest for learning**																													
	Develop aims and values that are credible; **underlying limit is the clarity and credibility**																													

Table D-14: Challenge of Walking the talk and The Iceberg Tool Matrix

		The Iceberg															
		Story telling in a group	A simple three level diagram used to **differentiate events, patterns, and structures**	Encourage looking more deeply for the **underlying structure** to help understand what's going on and why; begin identifying higher-leverage actions	**Causal connection**	**Mental models**, these are an even deeper kind of structure, showing different ways of seeing the world	Combination of **top-down and bottom-up strategies**	Seek to **close the gap between current performance and an organizations potential**	Helps us to understand deeply **ingrained assumptions** about how the world works; shape our habits and minds	Developing an **image of an organizational structure**, a problem area, or the future, we gain insight into how our organization operates and what it will take to change	Capabilities of the system as a whole or the interrelationship of processes especially as they relate to the **overall goals**	Consensus building, **participatory decision-making**, and all the other skills needed for teams to function effectively	**Trust** that the resulting shifts in power will be of benefit to the organization	**Shift from this event orientation** to focusing on the internal system structure, you improve possibility of improving business performance	**Patterns** are trends or changes in events over time
Walking the talk	Need individuals to take responsibility for changes and new ways of operating; **empower others** to act on the vision														
	Business as usual is how the challenge perpetuates itself, insidiously and unseen, masked by complacency, resignation, and taken-for-granted political games-playing														x
	Assumptions will only change gradually, through reflection, experimentation, and example; **reflection gap** develops if people do not become more reflective					x									
	Limiting process, trust required increases and the previously taken-for-granted low trust becomes an issue, creating a **trust gap**												x		
	With **credible and authentic advocates**, the credibility of the initiative will benefit														
	Requires a **shared understanding** of the values of company									x					
	Build the credibility by demonstration, not by articulation; lead by example														
	Work with **partners,** a partner is someone with whom we can speak openly and challenge our thinking														
	Cultivate **patience under pressure**														
	Reflect on values and think carefully about your **beliefs about people**								x						
	Develop a greater sense of **organizational awareness**									x					
	Many are **inherently cynical** about change														
	Organization-wide change often goes against the very **values** held dear by members; keep perspective					x									
	Get as much **feedback** as practical						x								
	Align behaviors on the part of senior executives		x												
	Leaders must **win the support** of employees, partners, investors, and regulators														
	Willingness to push themselves out of their own comfort zones and take risks; **quest for learning**														
	Develop aims and values that are credible; **underlying limit is the clarity and credibility**														x

Table D-15: Challenge of Walking the talk and Casual Loop Diagram Matrix

		Casual Loop Diagram																			
		Diverse action-oriented teams	**Specific help in addressing questions**	Exploring the existing causal theory; **chain of cause and effect**	Uncovering **critical mindsets**	Looking for **opportunities**	Identify **intermediate indicators** that the group can use to measure process	Identify important **reinforcing loops** that the group's actions may trigger	Ways that the **actions may get amplified** and lead to goals	Understanding how the system can resist change or push back on the group's effort through **balancing loops**	Reveals possible problems that the team needs to address in the strategy, but also an important disconnect between the intermediate **indicators and long term goals**	Listing of **external forces**, while sobering, helps the group see how it's actions fit into a larger picture and prompts members to consider how they might influence any of the external factors	**Identify potential** supporting actions, new areas of focus, and areas for further exploration	Account the important **feedback affects**	Surfacing a team's **assumptions**	Maintaining a focus on **strategy**	Direct action based on the **data collection and analysis**	**Focus the group conversation** on the most critical strategic issues or questions, **facilitation methodology**	Identify systemic **drivers of change and leverage points**
Walking the talk	Need individuals to take responsibility for changes and new ways of operating; **empower others** to act on the vision	X																			
	Business as usual is how the challenge perpetuates itself, insidiously and unseen, masked by complacency, resignation, and taken-for-granted political games-playing					X															
	Assumptions will only change gradually, through reflection, experimentation, and example; **reflection gap** develops if people do not become more reflective																				
	Limiting process, trust required increases and the previously taken-for-granted low trust becomes an issue, creating a **trust gap**							X													
	With **credible and authentic advocates**, the credibility of the initiative will benefit																				
	Requires a **shared understanding** of the values of company																		X		
	Build the credibility by demonstration, not by articulation; lead by example																				
	Work with **partners,** a partner is someone with whom we can speak openly and challenge our thinking																				
	Cultivate **patience under pressure**																				
	Reflect on values and think carefully about your **beliefs about people**														X						
	Develop a greater sense of **organizational awareness**																				
	Many are **inherently cynical** about change																				
	Organization-wide change often goes against the very **values** held dear by members; keep perspective																				
	Get as much **feedback** as practical													X							
	Align behaviors on the part of senior executives																				
	Leaders must **win the support** of employees, partners, investors, and regulators																				
	Willingness to push themselves out of their own comfort zones and take risks; **quest for learning**																				
	Develop aims and values that are credible; **underlying limit is the clarity and credibility**										X										

Table D-16: Challenge of Walking the talk and Action-to-Outcome Tool Matrix

		Action-to-Outcome															
		Understand the system structures which **cause the pattern of behavior**	**Graphically presents relationships** that are difficult to verbally describe	It is often necessary to consider **feedback within management systems** to understand what is causing the patterns of behavior	Starting point for analyzing what is causing a **particular pattern of behavior**	Helps to show **balancing structures** in which the difference between the desired state and the current state creates a **gap**	Multiple actors within the system, each with their own **perceptions** of what the desired state should be	Develop a **collective understanding taking into account the purpose and the audience**	May be perceived that the effort necessary to **develop alignment is an investment** for which the necessary **time and energy** are not available	Understand and **communicate the interactions** that determine the dynamics of a system	Show causal relationship and **illustrates circular feedback**	Help you **tell a story or express you interpretations or mental models** of how a system works	Indicate the **effect of the influence**	If there is significant amount of time between the action of one variable and the reaction of the next variable in the loop, a **time delay** can be indicated	**Hypothesize** about solutions to your problem and then test them	Helps show reinforcing loops: **compound change** in one direction with more change in the other direction	Helps identify resist change: **if growth falters or never quite starts; unproductive behavior never gets dropped**
Walking the talk	Need individuals to take responsibility for changes and new ways of operating; **empower others** to act on the vision																
	Business as usual is how the challenge perpetuates itself, insidiously and unseen, masked by complacency, resignation, and taken-for-granted political games-playing																
	Assumptions will only change gradually, through reflection, experimentation, and example; **reflection gap** develops if people do not become more reflective				X												
	Limiting process, trust required increases and the previously taken-for-granted low trust becomes an issue, creating a **trust gap**															X	
	With **credible and authentic advocates**, the credibility of the initiative will benefit																
	Requires a **shared understanding** of the values of company																
	Build the credibility by demonstration, not by articulation; lead by example																
	Work with **partners,** a partner is someone with whom we can speak openly and challenge our thinking																
	Cultivate **patience under pressure**																
	Reflect on values and think carefully about your **beliefs about people**						X										
	Develop a greater sense of **organizational awareness**																
	Many are **inherently cynical** about change																
	Organization-wide change often goes against the very **values** held dear by members; keep perspective																
	Get as much **feedback** as practical										X						
	Align behaviors on the part of senior executives									X							
	Leaders must **win the support** of employees, partners, investors, and regulators																
	Willingness to push themselves out of their own comfort zones and take risks; **quest for learning**																
	Develop aims and values that are credible; **underlying limit is the clarity and credibility**																

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