"USING ACTION RESEARCH TO PROMOTE NEW STS THEORY & PRACTICE"

Paper Prepared for:

International Action Research Conference
Work Research Institute
Oslo, Norway

Making the "Practical Turn" Practical:
collaboration across nationalities, professions and varieties of action research

Oslo, September 10th-12th 2007

By:

Carolyn Ordowich
Bert Painter
Pamela Posey

With

Barry Bateman
Craig McGee
Betsy Merck
Stu Winby

"USING ACTION RESEARCH TO PROMOTE NEW STS THEORY & PRACTICE"

ABSTRACT:

'Socio-Technical Systems' (STS) theory was pioneered in British coalmines in the 1950's. Major experimentation occurred in Norway during the mid-1960's. From the late 1960's to mid-90's, STS design methodology was used by many Fortune 500 companies in the US, Europe, Canada, and Australia to create high performing work systems. Thousands of projects were implemented successfully by companies across all industry sectors. Yet, by the end of the twentieth century, a significant decline in the application of sociotechnical systems theory was noted by practitioners in many of the countries where it had been so successfully applied! STS had followed the principles of life-cycle "S" curves as all technologies and living systems do, and its practitioners faced a choice—to abandon much of their traditional practice or to attempt discontinuous change in STS. In 2005, members of the STS Roundtable (an association of academics and STS practitioners) chose to launch an STS "Discovery" initiative, a true action research process to be carried out on two levels, to examine the causes of the decline and develop ways to apply STS concepts and methodologies to the problems of the 21st century. At the higher level, a framework/model was developed with a set of hypotheses about key lines (tracks) of potential innovation in STS theory and practice. On a second level, along 8 tracks of modern "STS Design Challenges", project information is shared, to help build a database of emerging STS applications and develop further understanding in how to continue to apply its principles in a world driven by technology and knowledge work. This 'action-on-the-ground' as reported in member projects contributes to a body of new knowledge in STS concepts and methodologies. To date, some of the activities and engagements that have been identified within the STS community are enlightening: new action research projects are underway, new applications are being implemented, and a clear framework for understanding and applying STS in a challenging arena of design complexity and trans-organizational enterprise is emerging. Through this action research process, we are creating innovation and continuing to preserve the core values and principles of STS, and finding new ways to apply them to the challenges of 21st century organizations.

STS Practice – an Overview

In the 1950's, researchers at the Tavistock Institute applied action research methodology to study group relations in the British coal mining industry. In comparing performance across mine sites, one research team discovered an unusual means of operation in one coal seam – autonomous teams regularly changed shifts and roles and operated with minimal supervision and outperformed other work groups. This newly observed work paradigm appeared to seek a best match between the requirements of the social and technical systems at work in the mining operations. It gave rise to a new conceptual framework in which work organizations were viewed as socio-technical systems rather than simply as social systems, the prevailing paradigm of social scientists, or as technical systems, the prevailing paradigm of engineers (Trist, 1950). Diffusion efforts took the inquiry into the Indian textile industry, where Rice's work in the weaving sheds of Ahmedabad showed early successes with socio-technical redesign of work (Rice, 1953).

Thus, socio-technical systems (STS) theory was pioneered through action research on an international scale. The findings were summarized by Emery (1959; 1967) in a generalized model of an enterprise as an "open" socio-technical system, with a "technological component" and a "work relationship structure", that are highly "interrelated" and require "joint optimization" in order to optimize overall organizational performance.

Major experimentation continued in Norway during the mid-1960's, where the Norwegian Industrial Democracy Project focused attention upon the value of STS in an unsettled, rapidly changing economic environment. Increasing demands for worker participation in decision-making from the trade union movement created opportunities for action researchers from the Institute for Industrial Social Research at the Technical University of Norway and from Tavistock to further apply and refine socio-technical system methods and outcomes.

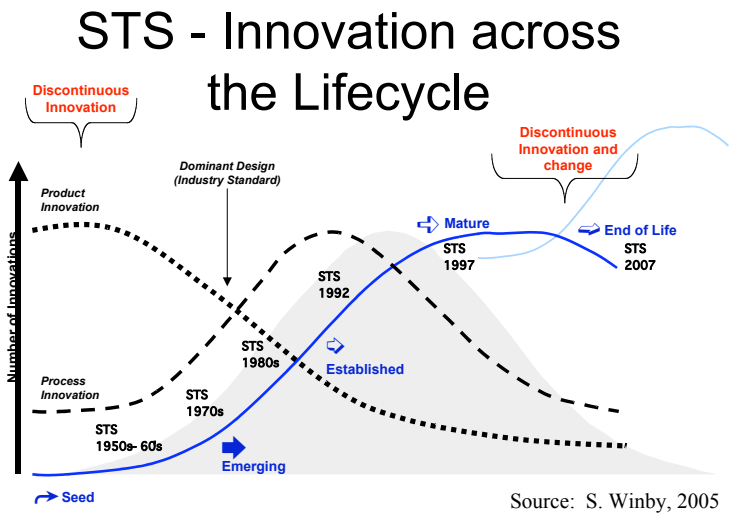
Through the late 1960's to mid-90's, the STS design methodology was used by many Fortune 500 companies in the US, Europe, Canada, and Australia to create high performing work systems. By the 1970s, companies (and increasingly, communities) in the United States and Canada were actively involved in a host of projects (Davis & Cherns, 1975), culminating in the 1981 International Conference on the Quality of Working Life (Kolodny & van Beinum, 1983). As well, the American and European collaboration of Davis (UCLA) and Cherns (Loughborough) had now articulated STS design as a set of principles and values (Cherns, 1976).

By the early 1980s in the US, collaborative processes were emerging, and new strategies for adaptive change and planning were being developed. Pava's (1980) discussion of normative incrementalism reframed some of our thinking by focusing us on the need for a collaborative model of operation as a fundamental characteristic of successful organizations in a changing environment. His later research into non-linear knowledge work continued to press for new sociotechnical insights in new work contexts (Pava, 1986.)

Throughout this period, STS practice was influenced to varying degrees by significant innovations that had developed their own 'parallel' identity, in Australia and Scandinavia. Action research by the Emerys led to the Australian innovation of participative design workshops and the search conference (Emery, 1982; 1989). Also noteworthy was the Swedish LOM program (Gustavsen, 1985; 1989) that demonstrated the possibility of multi-organizational collaboration through "democratic dialogue", in an emergent "socio-ecological" approach.

Yet, by the end of the twentieth century, practitioners noted a significant decline in the application of socio-technical systems theory in many of the countries where it had previously been so successfully applied! In fact, as Figure 1 illustrates, STS had followed the principles of life-cycle "S" curves as all technologies and living systems do.

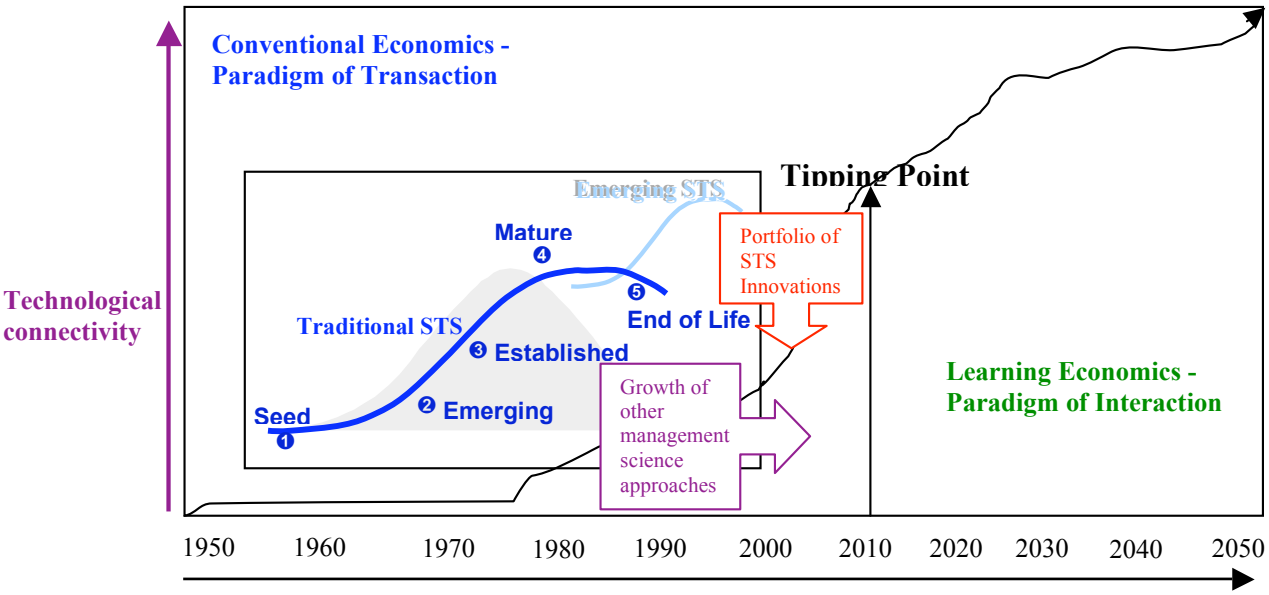
Figure 1. STS Lifecycle "S" Curve



Source: S. Winby, 2005

This review of STS practice takes us to where we are today, at the end of one lifecycle of innovation. At the same time, as Figure 2 suggests, we are at the tipping point of a profound change that is taking place in the business world, a point that will affect how industries are structured, businesses are created and how organizations are designed, and we feel *STS is more relevant than ever to the new context* that will unfold.

Figure 2. Discovering the Contemporary Face of STS



Need For STS Application – aligning strategy, organization structures, employees and technology in an interrelated, jointly optimized way that recognizes the dynamic interplay among internal elements and the external socio-economic and technical environment.(Source: Ordowich and Winby 2007)

It is fortunate that the founders of STS theory had the foresight (beginning with Emery & Trist, 1965) to understand the seismic shift in the economic and technological landscape that would reshape all other domains of life and created the principles and concepts to address these changes. It appears that early STS theory and practice may have been well ahead of its time, when the new landscape of complexity-connectivity was little understood and all of these changes were interpreted in terms of the old paradigm of transaction.

It is time now to leap forward into the new context with STS concepts and practice designed for the complexity of today's environment. To help us do so, we have chosen to look at socio-technical systems theory from an innovation perspective, and then, to evolve STS through a renewed "action research' effort.

The Challenge of Discontinuous Change for STS Practice

Foster's (1988) work on innovation introduced the 'S' curve analogy to help explain life cycles of change processes. Essentially, as a concept or process develops and grows, returns to effort over time are initially small, and then grow exponentially once a 'dominant design' is established, before falling off as the natural limits of the technology are approached. As this falling off occurs, it may be time to choose to move to a new and different "S" curve rather than die out. By the turn of the century, this was the choice faced by STS practitioners — to abandon much of their traditional practice or to attempt discontinuous change in STS and move to a new 's' curve.

A core issue raised in Foster's discussion of life cycle and 's' curves is one of incremental versus discontinuous change. When a path of incremental change or incremental innovation is pursued, it builds something on a base that is not new: it generates additional thinking based on existing ideas and practices; this sustains growth in an environment that has

growth capacity by adding some functionality to create wider variation or by extending existing technology to different arenas. Incremental innovation thrives in structured environments characterized by continuous product and process improvement, much like those of the latter half 1900's. It moves up the 'S' curve. Incremental innovation is not, however, sustainable over the long term unless the capacity of the environment to grow continues in the direction it has been moving

Discontinuous innovation is the answer where the environment has changed dramatically or where fundamentally new technologies have appeared and shift us to a new and different curve. In discontinuous innovation, growth comes from the creation of new technologies providing new customer value or from the displacement of existing ways to deliver customer value. As a growth strategy, discontinuous innovation either cannibalizes an existing technology or creates new business opportunities altogether. It is an appropriate strategy in a mature environment that requires significantly new approaches to success or in a significantly changed environment.

STS had been a technology that specifically and effectively resolved the workplace problems of the 60's, 70's, 80's, and even early 90's. Yet, in the face of changing paradigms of work, dramatically changing contextual challenges, and the rise of new management science technologies, it seemed to become increasingly irrelevant as a technology, though its values were as important and relevant as ever.

STS outlived its ability to sustain incremental innovation and faced a new and turbulent environment. As Winby and Taylor (2005) have suggested, for STS to grow and succeed as a viable concept, philosophy, and contribution to the world of work, it must undertake a discontinuous change by creating new STS technologies that provide new-to-the-world customer value and displacing existing ways of delivering customer value.

Taking Up the Challenge through Action Research

In 2005, members of the STS Roundtable (an association of academics and STS practitioners whose educational purpose is to be an open learning community that advances the values, theory and practice that create healthy and powerful human work systems that are demonstrably capable, humane and responsible) chose to launch an STS "Discovery" initiative, a true action research process, to examine the causes of STS decline and develop ways to better apply STS concepts and methodologies to the problems of the 21st century. Building on a collective desire to create more meaningful work systems, a commitment was made to inquire into, reflect on, and take action in the world by innovating STS application, creating a **portfolio of STS innovations** that will stimulate further inquiry and contribute to the transformation of our world.

At its simplest, action research is a systematic study and resolution of an issue or problem which is informed by theory and concept. Argyris tells us that ″action research is intended to describe holistically what happens in naturally occurring settings, and to derive from these observations more broadly applicable principles or actionable knowledge." (Argyris, 1996). Our community members have completed or are presently carrying out STS projects, which we are asking them to share with us so that we may derive knowledge about the future use of STS.

Our dialogue with our community members is an action research inquiry designed (according to Torbert's (1998) four territories of experience – intentionality, planning, action and outcomes) to help us to understand STS intentions, improve our capacity to plan STS strategies that reflect our aspirations to create healthy and powerful human work systems, to reflect on the skills of our implementation, and to see the impact of our actions to determine if our aspirations have been realized in this new economic context. All this inquiry about a project is captured

and then reflected on in terms of how this addresses the *economy of interactions* so that we can eventually create actionable knowledge.

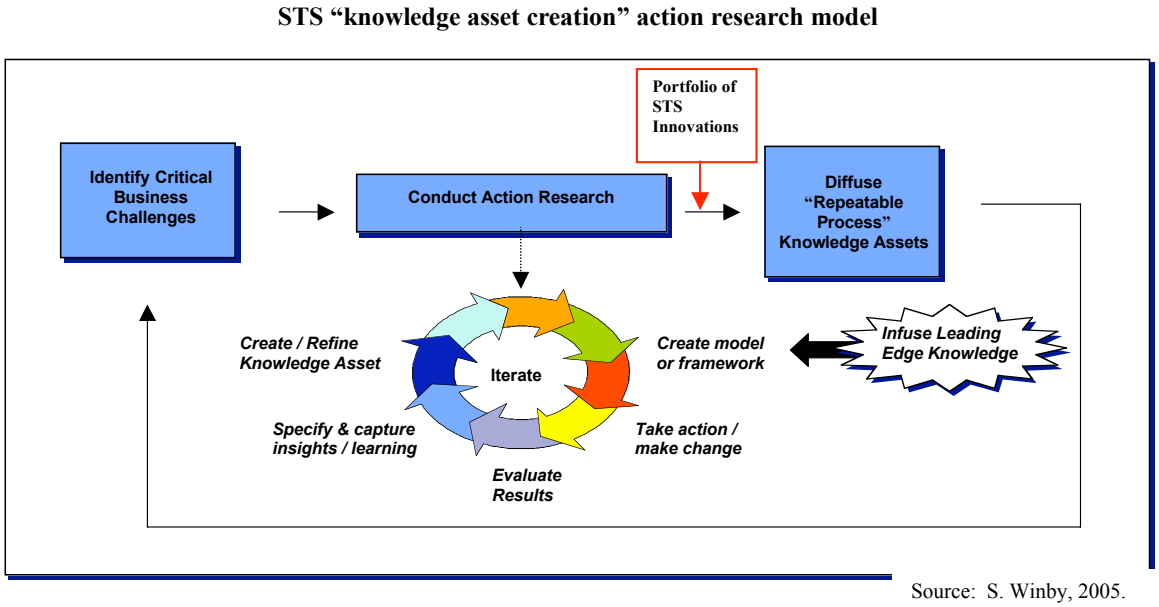
Through such efforts, we hope that STS can become a dominant model in the learning economics/paradigm of interaction context, and plan to use the action research process to initiate and support this goal.

The STS Discovery Team is acting as the steward of this process, with the hope of continuing to engage many individuals and teams, both within and outside our STS community, along the way. In fact, from the start, the engagement of our STS community has been very helpful. The project had initially been referred to as "STS Reinvention", but the Roundtable membership was very concerned that the term "Reinvention" would tie us too closely to the past and might block the innovation we sought. Therefore, the term "Discovery" was proposed to emphasize our objective of "radical" innovation (based on STS principles and values). We look forward to future guidance from both within and from outside our STS community.

The STS Action Research Model

The action research model utilized in this project is shown in Figure 3. Essentially, the process starts with identification of critical business challenges, then moves through a five-phase action research process (i.e., the 'discovery process') from which a portfolio of STS innovation is developed. The creation of the portfolio is the intermediate result we require before we can generate the future STS "knowledge assets" that can be diffused.

Figure 3. STS Action Research Model



Source: S. Winby, 2005.

We begin with identifying and understanding the key business challenges we face in today's complex environment, and on understanding how these challenges and this environment differ from the traditional ones. We next undertake an action research process derived from earlier socio-technical systems work by Susman (1983) and others. Our approach is consistent with viewing action research as a process of both helping organizations as well as gathering data for further scholarly reflection and potential contribution to knowledge.

Critical Business Challenges

The New Economic Paradigm

Globalization and technological innovation have generated a new economic paradigm. In conventional economics, real capital means plant and physical equipment, and growth is explained by better accumulation of both. Yet, according to Arnold Kling (2004), well over half of today's economic growth is explained by the better use of ideas or intellectual property, and the capital needed for production facilities is relatively unimportant. Instead, more capital is

absorbed in the processes of searching for ideas, marketing them and testing consumer response; and he expects the balance to continue to shift in most industries toward greater importance for research and testing, with relatively less importance to physical plant and equipment.

Kling says the evolutionary mechanism of the learning economy was anticipated in Schumpeter's phrase 'creative destruction', and that the creative destruction that took place in Schumpeter's day was a relatively gradual process. This cycle is now speeded up and observable; in STS terms, we are now living the turbulent environment. As Kling suggests, the fundamental economic focus shifts from traditional resource allocation to how an economy functions as a learning mechanism, sorting through innovations to find those that provide genuine improvements in living standards. McKinsey researchers have also done extensive research on this economic shift, and their results concur with Kling's notion of an economic paradigm shift.

> "The modern world economy is in the early stages of a profound change in the shape of business activity. Two centuries ago, dramatic shifts in the economics of transformation – of production and transportation – precipitated the Industrial Revolution. An upheaval of equal proportions is about to be triggered by unprecedented changes in the economics of interaction. Interactions - the searching, coordinating and monitoring that people and firms do when they exchange goods, services, or ideas – pervade all economies, particularly those of modern developed nations….Yet business leaders will find it difficult to anticipate the opportunities and threats this change will present because our assumptions and thinking about strategy and organization are based much more on the economics of transformation than on the economics of interaction. To recognize, understand, and act on the hidden power of interactions, we will need to adopt new mindsets, new measurements, and new vocabularies" (Butler et al, 1997, p. 5-6).

The Challenges of the Learning Economy for Business and Organization Design

The faster pace of specialization, globalization, and technical change forces us to realize that something different is happening in the economy. We see new types of companies, new customer demands, and extensions of supply chains, but it is less easy to identify changes in the

nature of work itself, and much of what this new economy means to the business world is still obscure. But if we simply stop and reflect, we will recognize the dramatic increase in the volume and value of interactions.

> "Indeed, technology has in large part been responsible for the acceleration of tacit interactions over the past 20 years. Two decades ago, international calls were costly and email was a novelty; today, global voice connections are cheap, people around the world send about 30 billion emails a day, and entirely new technologies – broadband Internet, search capabilities such as Google, mobile phones, personal digital assistants such as Blackberries and Treos, and video-conferencing – make it possible for tacit interactions to happen more easily." (Beardsley, et al, 2006, p.62)

The McKinsey research shows that "in most developed economies today, four out of five nonagricultural jobs involve interactions; only one in five involves extracting raw materials or working on a production line. A century ago, the proportions were reversed. This shift is under way in the developing world as well". (Beardsley, et al, 2006, p. 54.)

We are confronted today with a new context of work founded on this new economic paradigm. Forerunners of some innovative business and organizational models are already in evidence, but they tend to be seen as isolated exceptions – just as is STS practice. But with far greater interactive capacity on the near horizon, every business will need to revisit and challenge its assumptions underlying existing strategy and organizational models. We are striving to get STS ready to meet this new demand. Some of the early work of STS and other approaches generated the flatter organizations of the 1990s, and these are in fact "an early reflection of the growing ability to manage distant frontline activity through interaction technologies" (Butler, et al., 1997, p. 21). The impact of the new economics on forms of organization will be equally profound.

Further research from McKinsey notes that "some large Silicon Valley ventures are experimenting with what should become another widespread phenomenon: the use of internal

markets. Here, users bid for input from specialized professionals on contracted activities, relying on supply and demand rather than supervisors to exercise discipline." (Butler, et al. 1997, p 21). While the flatter organizations already have changed the traditional coordination and monitoring roles of managers, this kind of transformation will take management to a new level of maturity. However, there will be many organizational challenges to design such an organization.

In conventional economic thinking, companies have used technology to boost performance by eliminating the least complex jobs through streamlining processes, automating routine tasks, or outsourcing production and clerical jobs. But this has now tipped the balance of work toward complexity. The McKinsey research shows the number of jobs that involve relatively complex interactions (which require judgment and experience) growing at a phenomenal rate.

Technology will need to be used to make these employees better at their jobs by complementing and extending their complex-interacting capabilities and activities. However, optimal performance will again depend just as much on the quality of the social system design.

> "The use of technology to complement and enhance what talented decision makers do rather than to replace them calls for a very different kind of thinking about the organizational structures that best facilitate their work, the mix of skills companies need, hiring and developing talent, and the way technology supports high value labor. Technology and organizational strategies are inextricably conjoined in this new world of performance improvement." (Johnson, et al, 2005, p.22)

To respond effectively to these new demands, STS will have to develop concepts and methodologies that design for the profile of interactions critical to business success, that design processes for determining how to allocate investments to improve both transactional and complex interactions, and design more complex measures and rewards for multi-boundary employees who collaborate to achieve results.

We see STS as the ideal response to these needs, but the competitive barriers are strong. For example, "network analysis" is viewed as a new management science that is vigorously addressing these issues. It can help identify not only where complexity does lie, but also where it should lie. This methodology maps the value of employee collaboration very much like STS variance analysis does, showing networks of relationships and highlighting critical roles. STS is well suited to address this need if it learns how to adapt to it. In fact, in the late 1970s and early 1980s, Trist (1981) identified networks and network analysis as fertile ground for STS diffusion and innovation.

Furthermore, the embodiment of STS values and concepts (see Table 1) is predicated on designing organizations that encourage employees to explore new ideas, to operate in a team-oriented and unstructured way and to organize themselves for work in a collaborative environment that fosters change, learning, shared values, and innovation. This is crucial in today's environment.

Table 1. STS Design Principles and Performance Requirements

STS DESIGN PRINCIPLES AND PERFORMANCE REQUIREMENTS	
DESIGN PRINCIPLES	**PERFORMANCE**
■Customer and environmentally focused design ■Empowered and autonomous units ■Clear direction and goals ■Design for minimal critical specs ■Control of variances at the source ■Socio-technical integration ■Accessible information flows ■Enriched and shared jobs ■Empowering human resource practices ■Empowering management structure, process, and culture ■Capacity to reconfigure	■Reduced Costs ■Increased quality ■Enhanced internal motivation ■Lower turnover and absenteeism ■Increased learning ■Increased capacity to adapt ■Quality of working life

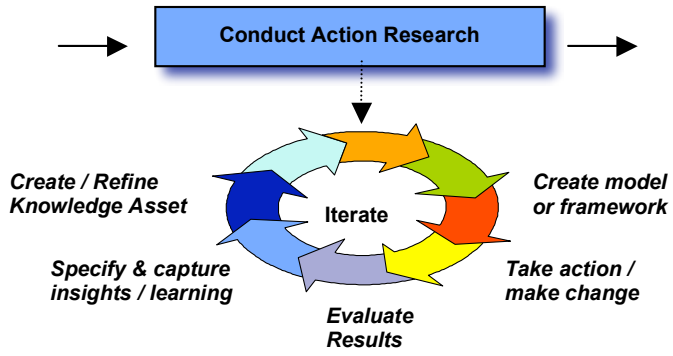
McKinsey sums up the critical business challenge for us as STS designers as follows:

> *"For many employees today, collaborative, complex problem solving is the essence of their work. These "tacit" activities – involving the exchange of information, the making of judgments, and a need to draw on multifaceted forms of knowledge in exchanges with coworkers, customers, and suppliers – are increasingly a part of the standard model for companies in the developed world. Many employees engage in activities of this kind to some extent; production workers at Toyota Motors, for instance, collaborate continually with engineers and managers to find new ways of reducing costs and solving quality problems. But employees such as managers and salespeople, whose jobs consist primarily of such activities, now make up 25 to 50 percent of the workforce…. During the next decade, companies that make these activities – and the employees most involved in them – more productive will not only raise the top and bottom lines but also build talent-based competitive advantages that rivals will find hard to match." (Beardsley, et al, 2006, p.53)*

The Discovery Framework For Inquiry

As Figure 2 showed, our model for research began with identification of critical business challenges – the development of an understanding of the new context or business environment facing us today and in the future. Once we had an understanding of the context, we moved into the actual action research process shown in the model in Figure 4.

Figure 4. The Action Research Process



The first step of the action research cycle is to create a framework for inquiry before taking action (step 2) or making change (step 3). Next comes an evaluation phase from which we capture insights and lessons for the future. The fifth step is the creation and refinement of knowledge assets. We are currently involved primarily in the first stage of the action research - creating a *framework for inquiry* - that is now being used to gather data about what innovation is occurring in our field, and within the STS community.

Our first step was to translate the critical business challenges we have identified above into challenges for STS design. This would help us develop a *framework for inquiry*. Based on careful analysis of the environment and critical business challenges in that new context, eight STS design challenges were identified:

1. Shifting entry point for change,
2. Larger scope of system or unit of analysis,
3. Increasing design complexity,
4. Increasing leverage from the customer,
5. Pressure to increase integration,
6. Greater linkage with other organization improvement and strategic paradigms,
7. Increasing role of technology, and
8. Tighter governance of management and organization processes.

Each is listed in Table 2 below. For each challenge, based on the expertise and experiences of the research team, an interpretation of how traditional STS principles would apply to these challenges and an identification of emerging and/or contemporary STS descriptors was developed.

Table 2. The Discovery Model/Framework – 8 Core Design Challenges

7-STEP STS DISCOVERY MODEL		
Sociotechnical Design Challenges Tracks	**Traditional STS Principles**	**Emerging & Contemporary STS Descriptors**
1. Entry point for change shifting from operational to strategic	• New plant startup • Plant level redesign • Operational efficiency	• Shift in organizational focus to strategy • Broader context than operations like need for globalization/market development or growth • Perceived drop in shareholder value • Formally the invitation was to apply a method; now the invitation is to improve (operations, outcomes, results, sustainability) • Not limited to "time, territory, and technology"; emerging lens is "social/technical/environmental/personal" • Business Model Design
2. Larger scope of "system" or unit of analysis to be designed in a global world	• Traditional unit of analysis on one site, one department, with a defined input and output boundary.	• New unit of analysis is value chain – value network, not production system • More likely to include multiple organizations, often spanning different geographies or legal entities • Multiple organizations mean more difficult power dynamics – varied stakeholders in a messy process • More difficult to identify what is "the organization" (1) identity; (2) integration, (3) individuals (employees, contractors, contingent) • New multiple models/boundaries/definitions of organizations • People connected to purpose, larger than one organization can evolve • Emerging need to work in micro & macro systems simultaneously • Movement from multi-skilled to multi-professional teams (can't learn multiple professions – how to design?)
3. Increased complexity of the design	• Emphasis on natural work team design often resulting in autonomous or semi-autonomous work teams • Social dimension of STS focused on social interactions of individuals	• More complex designs often with a "hybrid" model • Multiple dimensions to the design …product, geography, technology, etc. • More complex reporting relationships often with multiple lines of authority • More strategy-structure focus • Greater need to design to support overall health of the organization; greater challenges in optimizing organization health and business needs • Understand boundary as temporary • Think globally; eat/drink locally (build relationships) • Influence structure as an element of design process (power)
4. Customers have greater leverage and power	• Focus on output • Emphasis on time, territory, and technology	• Customer requirements frequently starting point and center of design process • Move complexity inside and make easy for customer, requiring new models of

		organization (front – back)
5. Pressure for greater integration	• Emphasis on drawing organizational boundaries and defining roles to maximize "variance control" within the organizational boundary	• Greater emphasis on designing coordination mechanisms and structures across organization boundaries • Designing and creating virtual relationships • May need multiple systems to deal with needs of different employees
6. Increasing linkage and leverage with other organizational improvement and strategic paradigms	• Continuous process improvement • TQM • Principles, purpose, and potential (the heart of the work) • Values, philosophy, dignity, respect & worth for people • Fulfilling human potential • Building humane enterprises (social capital) • Re-emphasize the "S" to counterbalance the "T" • Balancing the emphasis on tools, techniques with the human (principles, purpose, vision, dignity, worth)	• STS linked to process re-engineering, strategic planning and innovation • Increasingly linked to facilities design
7. Increasing role of technology	• Track performance of core work transformation process • Maintain stability in core work process	• Track and integrate with overall business performance/planning • Track/coordinate operation of major business processes (supply chain) • Provide business metrics and decision-support systems • Greater role in supporting collaboration and integration across entities • Organizations looks different when participants are working virtually – brick and mortar; geography; relationship to community are less important (cessation is normal) • Strengthened principle of "technological choice": software technology is potentially much more flexible than hardware, and more adaptable to needs of social systems
8. Tighter governance of management and organization processes	• Emphasis on designing human resources systems to support work team design and process (pay for skills, gain sharing, peer selection, etc.)	• Greater emphasis on designing management processes (resource allocation, planning, budgeting, etc.) • Move from holding company model to corporate strategy requiring cross unit council structures

An initial design of the framework was presented (in a poster format) to a meeting of the STS Roundtable (Portland, Oregon, 2006). Participants added comments from their experience, and the framework was modified to its current form.

The action research project is underway, yet we must remember that the STS Discovery Framework For Inquiry shown in Table 2 is a work in progress and, as such, is incomplete. It is anticipated that the broad STS community will continue to help refine our understanding of the challenges as we learn together. Yet, despite being incomplete, the framework has started to demonstrate its usefulness in organizing project and reference data that we are now gathering from the field.

The STS Discovery Process

Consistent with viewing action research as a process of both helping organizations as well as gathering data for further scholarly reflection and potential contribution to knowledge, we want our methodology to be highly interactive with the STS community of which we are a part. One of our interaction processes involves a web site that enables all participants to have a "threaded dialogue" about all the learning that unfolds. Currently, most of the discussion threads are organized according to the "STS Design Challenges" described in Table 2.

Along the eight tracks of "STS Design Challenges", members are starting to share information about their projects, for assessment and refinement, to help build a database of emerging STS applications and develop further understanding in how to continue to apply its principles in a world driven by technology and knowledge work. Using templates that simplify organization of the data for input to the site, participants are asked to share information about their projects that will help inform the research. Our intent is to process this data, at our Roundtable meetings, and increasingly through our online discussion forums, using a 7-Step Model that builds upon the STS Discovery Framework For Inquiry.

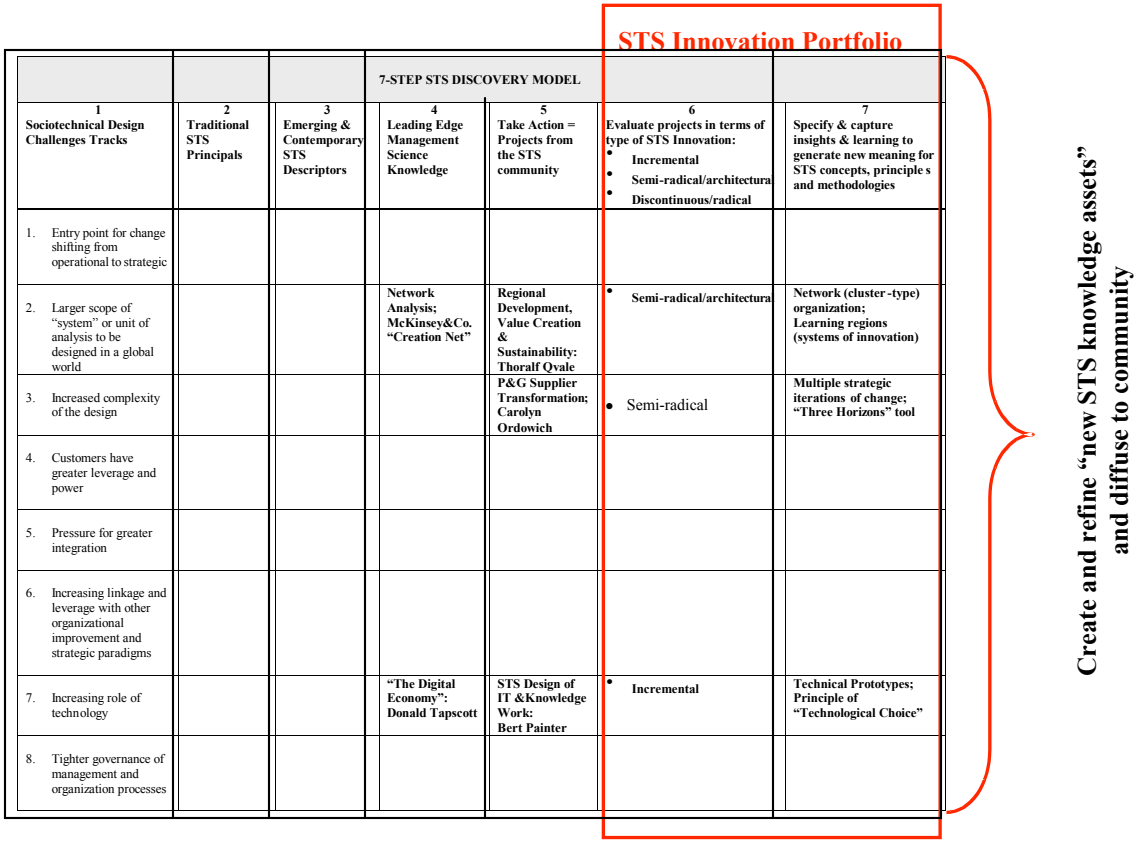
As mentioned above, the framework is evolving as we go forward. Onto the original framework, we have already added a Column 4 that is designed to capture our learning from

others outside the STS community, especially from the leading edge management science literature. We have requested references from the community to help us gather this knowledge.

The next three columns represent stages 2, 3 and 4 of action research – take action, evaluate projects, and specify and capture insights and learning to generate new meaning for STS concepts, principles and methodologies. This entire "discovery thinking process" will result in an **STS Innovation Portfolio**, which should enable us in a second phase to create and refine "new STS knowledge assets" that can be diffused to the STS community at large. Table 3, on the next page, presents a diagram of the entire 7-Step model.

How this model is used to collect, aggregate, and evaluate project information within the STS Discovery Process can be illustrated by reference to three of the project reports that have been documented within the STS community: (1) *Regional Development, Value Creation & Sustainability*, Thoralf Qvale, WRI; (2) *P&G Supplier Transformation,* Carolyn Ordowich*;* and (3) *STS Design of IT & Knowledge Work,* Bert Painter. Each project has been evaluated in terms of the type of STS innovation (step 6). Then, through discussion and analysis with the authors of these project reports, an effort has been made to capture insights to help generate new meaning for STS concepts, principles and methodologies (step 7) that will contribute to an STS Innovation Portfolio.

Table 3. The STS Discovery Model – Innovation Portfolio



As an example of how this model can be used to collect, aggregate, and evaluate project information, we have included the documentation of the "P&G Supplier Transformation" as reported by Carolyn Ordowich in Exhibit 1, on the next 2 pages. This project involved a strategic business unit of a large chemical company undergoing a business transformation from the role of a basic supplier to a technology partner to the Proctor & Gamble Corporation. One significant learning from this project in particular (and an addition to the STS Innovation Portfolio) has been a "three horizon" tool that enables a client system to make multiple strategic iterations of change in organization design and technology. There are also other lessons from other projects that have been collected through this dialogue process.

Exhibit 1. STS DISCOVERY COMMUNITY PROJECT

Name of Project Owner: Carolyn Ordowich

Sociotechnical Design Challenge Track: #3 – Increased Complexity of Design

Emerging STS Characteristics Highlighted:
- Multiple dimensions to the design (present to future business models)
- More strategy-structure alignment

Brief Project Description:

For generations P&G generated most of its phenomenal growth by innovating from within. In 2000, CEO Lafley dispensed with the company's "invent it ourselves" philosophy and created a "*connect and develop*" approach, using the world as a giant idea factory. Today the company searches everywhere for proven technologies, packages and products it can improve, scale up and market. Now the company collaborates on a massive, geography-defying scale with suppliers, competitors, scientists and entrepreneurs. P&G R&D productivity has increased by 60% and it has launched more than 100 new products for which some aspect of development came from outside the company.

As one of the suppliers invited to collaborate, my client saw this as a tremendous opportunity and began projects with P&G. By 2001, the business had several projects ongoing with P&G, and by 2002 with some other big producers in the industry. By 2003, the year I was engaged, operating profit had grown to 40%. While the CEO of his company was happy with the results, he was worried about the sustainability because he understood neither the strategy nor the organization required to deliver this. In fact, the organization changes he was witnessing in this business unit were creating problems with the rest of the corporation – changes he had to manage. And he felt his business unit leader was experiencing burnout. So the CEO required this business unit leader to get help to articulate both the strategy and design. I was engaged to help with this articulation as well as ensure the organization design for the future was being evolved in a way that optimized the contribution of all the staff. While not called socio-technical systems change, I felt the client in his own words espoused these values. My client at first was the Business Unit Leader and his management team, but later broadened to the engagement of the rest of the business unit workforce who numbered about one hundred.

The business unit leader had backed into a massive change – strategically and operationally. He and his team needed a conceptual map of what this change meant that they could own and continue to develop. I needed a conceptual tool to help them but I did not have one in my socio-technical toolkit. I did some research and found a concept called "three horizons" which I adapted for use with my client. The tool helped the organization to see the present and the future strategies and organization designs at the same time. The team adopted the model as their own and created "their story" for the CEO that was well accepted. The organization as a whole continues to use this tool to forward their efforts of growth.

This is a story of business transformation from a basic supplier of chemical products to a technology partner that changed the relationship of the business unit with its parent company, changed its strategy and generated many organization issues. The three horizon conceptual map gave the organization members a way to continuously adapt their path to this new identity. Their story is still unfolding, but I expect they will succeed because of their confidence in their ability (because of the horizons) to take whatever comes at them and deal with it.

Exhibit 1 (continued)

The "three horizons" concept is from the book by Mehrdad Baghai, Stephen Coley and David White called The Alchemy of Growth – Practical Insights For Building The Enduring Enterprise, Perseus Books, Reading Mass, 1999. The basic concept of three horizons is described as follows.

A horizon shows one what is imminent or coming into view. When playing 3-dimensional chess, one is focusing on only one dimension at a time in order to play, but the other boards are within one's peripheral view and consideration when making moves.

The horizons framework provides a coherent and simple way to communicate with employees at all levels about a complex strategic innovation activity. As well it is a management philosophy for growth, enabling everyone in the organization to consider the future, as well as this quarter's results, and consequently, to understand priorities. The three horizons must be integrated into a coherent migration path for the business and must be managed *concurrently*, not sequentially. Neglecting any horizon at any time weakens a firm's prospects of long-term growth.

For my client, we adapted the three horizons as follows:

Horizons	**2004**	**2006**	**2008**
3 - New Identity	5%	20%	60%
2 - Transitional	15%	40%	20%
1 - Current Business Model	80%	40%	20%

- New identity would be basically in place by 2008; by 2005, the current business model was transformed into an online business that required very little human resources to manage so most of those resources could be put to the new business design.
- Behind each horizon is an organization design that meets its needs. Like in 3 dimensional chess, the other organization designs are always within view and consideration when making changes.
- This conceptual map was also used to plan the technology changes underlying the new organization designs. It helped everyone speak the same change language.
- The change from current business model/identity as a basic chemical supplier to the new identity of technology partner in a multi-company network would take a lot of steps in accessing new talent, capability development, reward system changes, etc. which could all be plotted against this model.

Next Steps in the STS Discovery Project

The STS Innovation Portfolio becomes the raw material from which to create and refine new STS knowledge assets. We envision the STS community continuously re-populating the

innovation portfolio, generating new STS knowledge assets, and evolving into a community of excellence in STS.

We are still at the early stage of gathering data and gradually populating the innovation portfolio, yet we learn as we go forward. Actions are already being taken and new applications are being implemented as members of the community experiment with new knowledge assets. For example, the "three horizon" tool was recently used in a totally different STS project involving a large municipal law enforcement agency, and working papers are being developed that investigate issues that have arisen from the projects and associated work.

The International Action Research Conference (September 2007) in Oslo is one of a number of opportunities for the 'STS Discovery Project' to make direct cross-nation, cross-disciplinary contacts with individuals and organizations, such as those involved in the Telemark project and other endeavors about which we hope to learn. This is consistent with our objective to utilize the action research process to build bridges among researchers, consultants, and industry and community practitioners who value the action research approach to learning, who embrace the STS core values and principles, and who are committed to apply them in new ways to address 21st century challenges.

References

Argyris, C. (1996). Actionable knowledge: Design causality in the service of consequential theory. *Journal of Applied Behavioral Science*, *32*, 390–408.

Beardsley, S., B. Johnson, and J. Manyika, 2006. "Competitive Advantage from Better Interactions", McKinsey Quarterly, Number 2.

Butler, P, T. Hall, A. Hanna, L. Mendonca, B. Auguste, J. Manyika, and A, Sahay, 1997. "A Revolution in Interaction", McKinsey Quarterly, Number 1.

Cherns, A. 1976. Principles of Socio-Technical Design, *Human Relations* 29, pp.783-792.

Davis. L. and Cherns, A. (editors) 1975. The Quality of Working Life, Vol. 2: Cases and Commentary. The Free Press, New York.

Emery, F. 1959. *Characteristics of Socio-Technical Systems*. London: Tavistock Institute Document 527.

Emery, F. 1967. "The Nine-Step Model." Presented to an International meeting on Socio-Technical Systems, Lincoln, England. Vol. II, pp. 569-579.

Emery, M. 1982. *Searching*. Centre for Continuing Education, Australian National University, Canberra.

Emery, M. 1989. Participati*ve Design for Participative Democracy*. Centre for Continuing Education, Australian National University, Canberra.

Emery, F. and Trist, E. 1965. "The Causal Texture of Organizational Environments", *Human Relations* 18, pp.21-32. See also: Trist, E., Emery, F., and Murray H. (editors) 1997. The Social Engagement of Social Science, A Tavistock Anthology, V*olume III: The Socio-Ecological Perspective*, University of Pennsylvania Press, Philadelphia. Also retrievable from http://www.moderntimesworkplace.com/archives/archives.html

Foster, R. N., 1988. *Innovation*, New York, Simon & Schuster.

Gustavsen, B. 1985. "Workplace Reform and Democratic Dialogue". *Economic and Industrial Democracy*, 6.

Gustavsen, B. 1989. *Creating Broad change in Working Life: The LOM Programme*. Ontario Quality of Working Life Centre, Toronto.

Johnson, B. J. Manyika, and L. Yee, 2005. "The Next Revolution In Interactions", McKinsey Quarterly, Number 4.

Kling, A., 2004. *Learning Economics,* New York, Xlibris

Kolodny, H. and van Beinum, H. (editors) 1983. The Quality of Working Life and the 1980s, Praeger, New York.

Ordowich, C. and S. Winby, 2007. "Discovering the Contemporary Face of STS", presentation, discussion, and working documents.

Pava, C., 1980. *Normative Incrementalism*, Ph.D. Dissertation, University of Pennsylvania.

Pava, C., 1986 "Redesigning Sociotechnical Systems Design: Concepts and Methods for the 1990s," *The Journal of Applied Behavioral Science* 22, no. 3.

Rice, A.K. 1953. "Productivity and Social organization in an Indian Weaving Shed: An Examination of the Socio-Technical system of an Experimental Automatic Loomshed", *Human Relations* 6, pp.297-329. See also: Trist, E. and Murray H. (editors) 1993. The Social Engagement of Social Science, A Tavistock Anthology, *Volume II: The Socio-Technical Perspective*, University of Pennsylvania Press, Philadelphia. Also retrievable from http://www.moderntimesworkplace.com/archives/archives.html

Susman, G. I., 1983. "Action Research: A Socio-Technical Systems Perspective" Ed. G. Morgan, London: Sage, pp. 95-113.

Torbert, W. (1998). Developing wisdom and courage in organizing and sciencing. In S. Srivastva & D.L. Cooperrider (Eds.), *Organizational wisdom and executive courag*e (pp. 222–253). San Francisco, CA: Lexington Press.

Trist, E. L., 1950. "The Relations of Social and Technical Systems in Coal-Mining", Paper presented to the *British Psychological Society*, Industrial Section.

Trist, E. L., 1981. "The Evolution of Socio-Technical Systems: A conceptual Framework and an Action Research Program", Ontario Quality of Working Life Centre, Ontario Ministry of Labour, Occasional Paper No. 2.

Winby, S. "Learning Curves and Life Cycles", presentations and discussions, STS Roundtable, 2005, 2006, 2007.

Winby, S. and J. Taylor, 2005. "STS Roundtable: the Reinvention Challenge", Presentation to the STS Roundtable Annual Meeting, Chicago, IL.