A Summary White Paper

On

Transforming the Natural Gas Distribution Company
Through Exploratory Innovation:

A Study on the Determinants of Success and Failure with
Technology Transference

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Background

Recent academic research on organizational adaptation, organizational transformation, and organizational innovation has increased our understanding about difficulties associated with instituting transformational initiatives such as technology transference into large, well established organizations. The OTI Center for Technology Advancement study summarizes the findings of this recent body of academic research and compares them to the results of a recently completed industry focused survey that accumulated data on the transference of small-hole technology into natural gas distribution companies (LDCs). Combining the insights of both bodies of information refines our notions about the failure modes and the success determinants for transferring technology into LDCs.

Over the past few years LDCs (local gas distribution companies) have been under significant stress due to external environmental pressures (customer expectations, stockholder expectation, government regulation, natural gas demand). To adapt to this turbulent environment LDCs have had to become more cost effective (budget cutting) and service minded. As a consequence, the LDCs have naturally turned to new promising technologies such as small-hole technology to gain operational performance advantages.
Historically, however, the transference of new promising technologies into the LDCs has frequently been accomplished with much difficulty, if at all. In fact, the industry failure rate for implementing new technologies has been quite high.

Research on successful organizational adaptation, including transformation initiatives and technology transference, has confirmed many of the technology transference experiences of the LDC industry. The OTI study reaches beyond the diagnostic analysis offered in the academic research and goes on to explore causes for the difficulties and prescriptive remedies that impact success.

Lest we think that the difficulties associated with technology transference are overstated, consider the findings of a Harvard Business School study that examined the outcome of 100 transformational events (technology transference included) in various industries. The longitudinal study found that the vast majority of the technology transference initiatives failed to meet the original expectations for the effort. In fact, almost 70% either fell significantly short of the promised benefits or they failed outright with the initiative being completely abandoned. Obviously LDCs are not alone in the difficulty to manage these transformational events to successful completions.

**Academic Research – Barriers**

**Organizational Health** - A research effort aimed at assessing the general “health” of an organization was conducted by Booz, Allen and Hamilton. They surveyed 50,000 respondents that were asked to rate their organization’s behaviors against a set of organizational psychology variables that when taken as a whole, provide an assessment of the organization’s health. The study found that while the real estate industry ranked as
the healthiest, the most generally “unhealthy” industry segment was the utility industry. Fundamentally, they define an unhealthy organization as one that has an unclear concept of decision making authority and less than free information flow processes. They go on to identify the major symptomatic behaviors:

*too much effort to achieve a consensus on solutions but nothing really ever changes,*

*many layers of management with a bent on “analysis paralysis”,*

*small task teams with no real decision making authority,*

*smart talented people who all pull in different directions.*

The general health of the organization’s psychology (culture) is a potential barrier to successfully transferring technology. When poor health is characterized by the symptomatic behaviors listed here, success rates fall significantly.

In general, it can be concluded that LDCs entertaining any form of transformational event, should make an assessment of their general health and then be prepared to structure specifically for the initiative and enlist the necessary prescriptive behaviors that will support radical departures from their past practices. The prescriptive remedies are covered later in this text.

**Underestimation** - The academic research identifies underestimation of the challenge for transferring technology by management as a major barrier toward a successful TT implementation. Apparently, all too often management places significant emphasis on assessing, evaluating and acquiring the prospective technology with very little consideration given to the issues of organizational readiness and implementation
governance. Readiness for change is discussed at length in a leading piece of research authored by Dr. Jimmieson, Dr. White and Dr. Peach entitled: Employee Readiness for Change: Utilizing the Theory of Planned Behavior to Inform Change Management. Their research suggests that change initiatives such as TT require alignment of management’s intentions for the initiative through three cultural mechanisms.

The first important mechanism is best described as **attitude** toward the change. The authors suggest that management is responsible for creating and stirring the intentions of the team related to the TT. In other words, management must describe the impact of the TT in two critical contextual frameworks. The overall contribution of the technology toward the betterment of organizational performance and the impact of the TT on employee work life are equally important in creating favorable behavior on the part of the implementation team members. Management must set the mental attitude at the onset of the initiative.

An important mechanism that governs employee behavior is the **subjective norm** of the overall group. Understanding the subjective norm of behavior requires that management anticipates the social pressure that is likely to be exerted on the employees that are directly connected to the TT process. The social pressure to behave in a particular fashion relative to the technology can either have a positive impact or a negative impact on the TT initiative. This cultural feature is typically determined by any number of historical patterns in the organization. Past successes and failures with technology set the overall tone for the subjective norm mechanism. Perceived threats pertaining to job security and
compensation levels certainly play a major role in establishing social pressure. Managements’ rationalization, justification and explanation for the TT change and its relationship to organizational performance and employee impact are critical in adjusting the subjective norm mechanism toward a favorable impact.

According to the researchers, those who are either involved in the TT implementation or directly impacted by the implementation of the technology will also have their behavior influenced by the perceived control mechanism. This mechanism impacts their behavior based upon their sense of freedom to behave according to their own desires. If they feel for instance, that they tend to operate outside of the “in-group” then, they behave largely independent of the subjective norm mechanism.

Typically, management has a sense of the organizational culture and its willingness to embrace change. However, the frequent mistake is to underestimate the change challenge by assuming that the authority of management is sufficient to cause change. As indicated by the research, employee readiness for change can and should be influenced by management through the three cultural mechanisms.

Core Practice Anchoring - Academic research on organizational adaptation supports the notion that TT is frequently a popular adaptive response for organizations to utilize in adjusting themselves within turbulent business climates such as that which the energy industry now confronts. The general dynamic is simple, the climate of business is in flux and therefore the participant must either adapt or drift toward extinction. Dr. Kraatz of
the University of Illinois describes transformational events as those that are discontinuous with the past and radical when compared to “core practices”. This definition certainly applies to a TT initiative. Core practices are those that are characterized as policies, procedures, cultural protocols, organizational structures, and generally “the way we do things”. Technology transference initiatives are a break with the past and therefore they represent the form of radical change that Dr. Kraatz discusses. Organizations that have no prior experience of successfully dealing with adjusting their core practices and introducing radical adaptive responses (TT) tend to lack the organizational structure and learning tools necessary to perform technology transference.

Dr. Hlavacek and Dr. Thompson, two researchers in the arena of organizational change from the State University of N.Y. at Albany and the University of Florida respectively, indicate that highly bureaucratic organizations have a particularly difficult time with radical change such as TT. The culture and organizational framework are designed to control the organization not to change the organization. In their words, these organizations are “hostile to innovation” and they tend to stifle the initiatives that are focused on change such as technology transference. Their findings parallel those of the Booze, Allen and Hamilton study. Simply put, not all organizations are automatically capable of properly supporting a TT initiative. Particularly for the bureaucratic and generally unhealthy organization, using the functional departments of the organization to orchestrate and embed new technology almost always results in disappointing outcomes. Organizations, to be successful, must first assess their general health and then create a structure and the necessary practices to achieve the promise of TT. They must first learn
and then employ the success determinants that improve the probability of success for TT initiatives.

**Academic Research - Success Determinants**

*Strategy and Deployment* - Improving the odds of successfully transferring technology begins with designing the overall TT strategy and the associated deployment plan. The strategy and plan should be driven by a specific mission statement that is created by the executive management team. Transformational events such as TT are strategic in nature and therefore require clear precise language of management’s intentions and expectations.

**TT Process Map** (see figure attached) - As indicated from the research, early adopters must understand that technology transference is a process of transformation and not an acquisition event. Procuring the technology without a plan for its implementation is a ticket to failure. In fact as we will soon see below, the transformation process is only considered to be operating in the Investigative Stage with the acquisition of the technology.

Third, TT is a process that requires persistence and diligence. It is not an undertaking either for the weak-of-heart or the unprepared. As an organizational transformation event, most TT initiatives take a considerable amount of time to become entrenched in the organizational fabric and their full implementation usually requires a strong
willingness to resolve issues (organizational as well as technical) and master the technology over a sustained period of time.

Successful TT initiatives move through three distinct yet seamless stages: Investigation, Experimentation, and Anchoring (exploitation of the learning in stages 1 and 2). Each stage presents unique challenges and therefore requires mastery of specific tasks (see figure 1). Additionally, there seem to be transition zones between the stages that act as buffers between the stages. Within the buffer regions some tasks vacillate back and forth until a clear path for further progress develops. However, the research also reveals that either shortcutting a stage or skipping over a stage almost always results in major setbacks and/or absolute failure for the TT initiative.

**Organize a Venture Coalition** - Cultural factors such as communication practices, behavior protocols, and work attitudes relative to change practices bear consideration in all technology transference initiatives. However, when the organization’s culture runs contrary to change initiatives, consideration elevates to concern.

To mitigate the barrier effects of the unhealthy organization, Dr. Westphal of the University of Texas suggests the use of a specifically designed in-house technology transference team. The OTI Center for Technology Advancement refers to this group as a Venture Coalition. The term venture coalition connotes a more accurate portrayal of what the group’s function and makeup must be for operational effectiveness. The venture is a new undertaking that is expected to transform an aspect of the organization’s function. It
is more than that of a typical committee cross functional team. The venture coalition shoulders a significant responsibility that requires a complete understanding of the risks and benefits associated with a new venture. It is a coalition because it requires a level of coordination and problem solving that surpasses that of a mere committee.

Constructing a functional venture coalition requires careful selection of members and purposeful coaching in communication and problem solving. The members will undoubtedly be challenged during the three stages of transference and the evidence suggests they will function best if they have a vested interest in the outcome. Certainly, if any of the members are existing internal organizational mentors; their overall influence over expected outcomes is enhanced.

**Specific Findings from a Natural Gas Industry Study**

A current study conducted at the OTI Center for Technology Advancement involved a sample of natural gas distribution companies that were deemed “successful TT implementers”. The participants provided exact data pertaining to the three stages of technology transference (Investigative, Experimentation, Anchoring). Respondents were asked to rate the results of their TT initiatives on a scale of 1 to 10 in relation to their expectations (promises) for the technology. A rating of 1 was defined as being “totally unsatisfactory” and a rating of 10 was defined as “meeting expectations”. The respondents had an average satisfaction rating for the Investigative Stage and the
Experimentation Stage of 8.25. The majority of the responding organizations were generally pleased with their results through the first two stages of the TT Process.

In most cases, the data indicated that the respondents had a mandate and a vision for the TT from top management. All of the organizations had instituted new communication processes to keep upper management and the organization, in general, informed about the initiative’s progress. Seventy-five percent of the respondents utilized a team to assist in the TT deployment initiative and all the respondents indicated a commitment to long-term involvement to sustain the effort of technology transference. All respondents in the study were, at a minimum, well into stage two in their respective initiatives.

At this stage of the findings, The Natural Gas Industry Study conducted by the OTI Center for Technology Advancement generally supports both the academic research in the field of organizational adaptation and transformation as well as the findings of the Booze, Allen and Hamilton study. The majority of the respondents had developed some form of a mission/vision that was at least supported by upper management. Most respondents prepared for the long-term transference with a deployment plan and a strategy for its implementation (organizational barriers reconciled). They also understood that the effort would take time and persistence just as the research indicated it does to have success. Since the study on the gas industry only included organizations with perceived successful TT initiatives, it was not surprising that most of the subject companies were working through the stages even if they did not realize the process as such.
A major finding of The Natural Gas Distribution Study pertains to how the respondents expect their TT initiatives to succeed in stage three (Anchoring). Of course, anchoring the technology in the organization is the eventual purpose of a successful transference initiative but not all of the respondents looked favorably on their future. Those (75% of the sample) respondents who organized and empowered a team (venture coalition) to assist with the technology transference had an average score for meeting their expectations in Stage three of 9 (on the 10 point scale). In contrast, those respondents who had not put a team together scored their prospect of success in Stage three of 5.7 (only slightly better than 50% chance of success). Obviously, constructing and operating a true venture team as a major component in the TT implementation plan yields an improvement in the chances for TT success.

**Conclusions**

Taken as a whole, the research on technology transference offers a roadmap for avoiding common pitfalls for TT initiatives and it further identifies some of the major determinants for success. Although one can certainly argue that the more “ill” the organization (as defined by Booze, Allen and Hamilton) the more likely outright failure of the TT initiative is to occur. Certainly, we can conclude that failure of the TT initiative is almost certain to occur when management fails to put strategies and tactics in place to address the common pitfalls and organizational barriers. Further, the evidence strongly suggests that the success determinants as outlined earlier are significant factors that improve the
probability of producing favorable outcomes through all three stages of the TT Process Map.

Although it was alarming to find that the utility industry is among the unhealthiest (Booze, Allen, Hamilton Study), research also indicates that technology transference serves to strengthen the organization’s effectiveness and overall health. Additionally, the research findings provide a basic understanding of the causes for failure and success with TT initiatives. As long as management avoids the “medicinal solution” mentality and subscribes to the long-term therapy concept of the TT initiative, the promises of new technologies can and will be realized.
References


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