Accelerating Sustainability: Integrating Context, Behavior, Technology, and Culture in Organizations

John H Reed and Jerome P Dion[1]

Abstract

The basic premise of this paper is the need to change behavior and culture, especially at the organizational level, to achieve the speed and magnitude required to effectively meet the challenge of environmental and economic sustainability. Over the past 40 years, a significant foundation of technological change in energy production and utilization has been achieved through a narrowly framed energy techno-economic decision model. The progress has been adequate to address some market-based geopolitical concerns arising from fossil energy markets. However, continued reliance upon this decision model is wholly inadequate if we are to address both the urgent challenge of global climate change as well as ensure a more robust and sustainable economy over the long run. A current imperative, for example, is to limit global mean temperature rise to 1.5° Celsius before 2050. This will require a significant increase in the rate of investment in efficiency and renewable energy production. But there are additional motivations for changing the model. Energy efficiency and renewable energy strategies are comparatively inexpensive relative to other tested mitigation strategies, the anticipated side effects are relatively well known, and there are substantial new business opportunities to be had. These energy systems are likely to be more robust. Changed energy use patterns are almost always accompanied by reduced waste, job growth, increased productivity, and reduced regulatory requirements. Improved sustainability will be central to the new model, including reduced and highly efficient resource use, improved social equality, and quality of life. To accomplish these ends, the techno-economic model needs the explicit integration of social change principles and methods to achieve the accelerated rate of change. This integration requires understanding individual, and importantly, organizational behaviors, how those behaviors arise and change within organizational contexts, and how evidence-based action frameworks can be applied to increase the probability of achieving and sustaining desired change.

Introduction

This paper proposes a strengthened interdisciplinary approach to increasing energy efficiency and renewable energy[2] utilization and sustainability. Widespread attempts to improve energy

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[2] The term “energy efficiency” is used throughout this paper. Where it is contextually appropriate, this should be read as “energy efficiency and renewable energy.”

efficiency began in earnest the early 1970s in the United States. By the middle 1980s, the basic design of these efforts was driven by a technology cost effectiveness model. Homes, commercial buildings, and industrial plants were examined to identify where efficiency could be increased such that the benefits outweighed the costs and the annual rate of return was competitive or quite frequently more than competitive with other attractive investments. Initially, the focus was one-to-one replacement of technologies such as lighting but evolved to systems, and then in the case of industrial operations and commercial buildings, whole facilities. The systems approach included introducing new technologies as well as potential redesign of systems to make them more efficient. This approach has resulted in substantial improvements in the overall energy efficiency and adoption of renewable energy technology in US society. But, it has recently been recognized that current approaches to efficiency and renewable energy are not sufficient to keep temperature rise below 1.5° C by 2050. Moreover, the current approach may be insufficient to ensure a more robust and sustainable economy, as a lagging energy and resource productivity may constrain larger gains in global economic productivity (Laitner, et al. 2018).

In the last 10 years, behavior increasingly has been recognized as an important component in advancing energy efficiency. Much of the research in this area has focused on changing individual actions and motivating personal efficiency behaviors. The roles of organizational behavior and culture and culture generally have received less attention. An exception can be found in the industrial arena, where strategic energy management efforts have included some organizational and cultural components. While energy is essential to industrial production efficiency, many energy efficiency efforts have become stove piped or isolated in the role of an energy manager and are therefore circumscribed, limited in scope, and not part of a larger sustainability culture and mission.

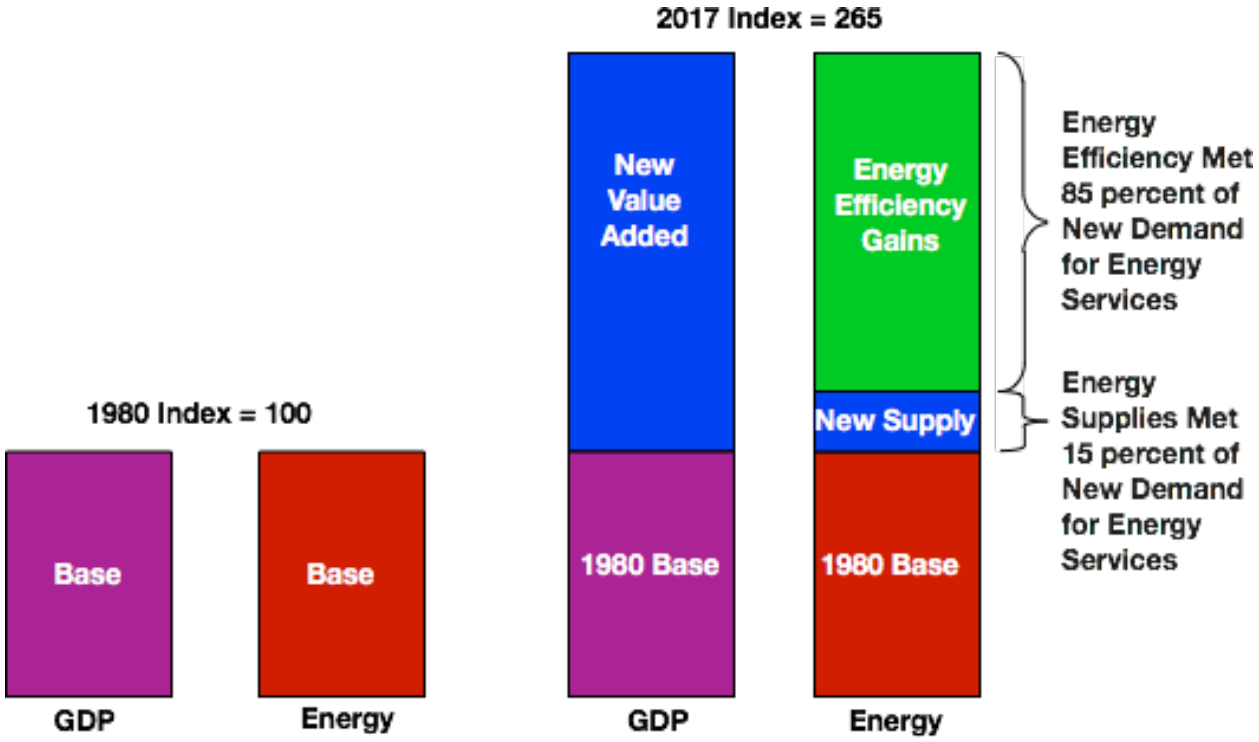
We tend to think that we can create change through conveying information, messaging, or making policy changes. But this approach reflects a misunderstanding of how social organization and culture arise. What the social science literature tells us is that an information campaign may not alter group or organizational behavior in the absence of other interventions. Organization and culture arise out of behaviors and social interactions. To create social change, it is necessary to "operate" on behaviors, to create new behaviors, and to intervene to change the social basis of existing behaviors and create a social basis for new behaviors.

This paper lays out a set of change strategies focused on behavior, organization, and culture. This approach goes beyond strategic energy management by making clear that energy efficiency, renewable energy, and sustainability must be a part of the technological, organizational, and cultural fabric of an organization and must also be considered in the larger contexts of long-term trends in society and sustainability in general. This course of action places a premium on defining and integrating energy efficiency and sustainability into the overall mission of the organization. Cost effectiveness is an important metric, but it creates a much too narrow frame for maximizing energy efficiency and sustainability. A key lesson from 40 years of energy efficiency projects is that such projects almost always have benefits beyond energy benefits—and that the value of the "other" benefits often substantially exceeds the

value of the energy benefits, but are seldom anticipated, estimated, and included in cost benefit analyses. Recognition of these "other" benefits most often occurs during post-implementation evaluation processes, if they occur.

The Case for Organizational Behavioral and Cultural Change

There is near unanimous agreement among scientists that the impacts of climate change are serious, consequential, and that current mitigation strategies are unlikely to meet the goal of keeping average global temperature rise to 1.5°C by 2050 (Figueres, 2017; Schleussner, 2016). Forty years of energy efficiency efforts have dramatically reduced the rate of growth in fossil fuel energy consumption and improved energy utilization. These efforts have included advances in lighting (CFLs then LEDs), appliances (refrigerators, HVAC equipment), building shells (materials, windows), building controls and automation, transportation (design, materials, engine efficiency, batteries, alternative fuels), and industrial process energy efficiency coupled with growth in renewable energy production, especially from wind and solar, which are in advanced stages of takeoff (Romm, 2016; Romm, 2017; Rogers, 2004). As a result of these innovations, actual growth in energy consumption was slightly more than a fifth of the expected growth between 1990 and 2010 assuming business as usual (Stinton, *et.al*). As shown in the following graphic (Laitner, 2018), 85 percent of new US energy demand since 1980 has been met by improved efficiency.



Source: John A (Skip) Laitner from US Energy Information Agency Data, April 2018.

Figure 1 Energy Efficiency Has Met 85 Percent of New US Demand for Energy Compared to New Supply since 1980

But this trajectory misses the hidden energy. For example, Apple Inc. has invested enormously in energy efficiency and sustainability moving rapidly to renewable energy throughout its facilities and its logistics chain. But more importantly, it is now making an organizational, social and cultural commitment to recognizing the embedded energy and potential chemical harms in its products and packaging. Apple has set an ambitious goal of reducing the harms and recovering that energy by recycling its old products into the cleanest possible streams of materials and using the materials in its new products rather than letting the energy in those products go to waste or be degraded to lesser valued resources (Apple, 2017). This is a "hidden" multiplier in the form of reduced energy to extract raw materials, transport them, refine them, and form them.

Some, such as Bill Gates, argue that new technology is needed to accelerate efforts to address climate change (Goodell, 2017; Johnson, 2018). However, there is convincing evidence that the technologies to meet the challenges are already at hand (Romm, 2017). The argument in this paper is that the needed multiplier is less a matter of technological innovation, but more a matter of changing behavior and culture at organizational, governmental, and societal levels.

Average global temperature and associated increases in CO_2 are a result of social choices (organizational, structural, cultural, and technological) and demographic trends. The techno-economic model referenced earlier is too narrowly focused on an energy-based cost metric to support the accelerated and broad-based change that is needed to limit the effects of climate change and provide the foundation for a more sustainable economy. Significant integration of behavioral, organizational, and cultural change with the techno-economic model is needed to generate the broad array of other benefits that can be powerful motivators for decision-makers and other actors.

Such integration goes beyond having a unified energy strategy (Healy, 2017). It is a matter of tying energy to the overall mission of organizations, driven by the self-interest of organizational decision makers [See Box 1]. Without this integration, it is unlikely that the rate of growth in fossil fuel consumption, its derivative carbon emissions, and the unsustainable use of resources can be effectively and quickly restrained within an acceptable period.

In a separate paper (forthcoming), the authors argue that cooperation and integration across current economic segments (buildings, transportation, manufacturing, automation, and government) can further accelerate

1. Collaborating to Accomplish the Mission

The energy manager for a grocery chain proposed changes to reduce the cost of lighting energy in its stores. This met strong resistance from the chain marketing manager who was concerned that the new lighting would change the aesthetics of the stores, reduce return visits, and reduce sales. C-level management supported the marketing manager. Later, the managers collaborated and developed a lighting plan that highlighted products and enhanced their attractiveness, thereby increasing the probability of purchases that satisfied both mission goals.

reductions in fossil-based energy use and CO_2 to improve sustainability. In response to economic pressures resulting from the great recession, the City of Lancaster, California changed its zoning code, streamlined permitting, created a solar financing program, and purchased electric buses. The city also worked with BYD, a Chinese clean energy developer, and KB Home to build affordable homes featuring solar panels, battery storage, and LED lighting. Lancaster is now encouraging BYD to build electric buses in the community. At the utility level, the City has constructed solar farms, is buying solar power from citizens within the City limits. and constructing a transmission line to Los Angeles (Deaton, 2017).

Broadening the Behavioral Focus to Organization, Culture, and Mission

The basic premise of this paper is the need to change behavior and culture, especially at the organizational level, to achieve the speed and magnitude required to effectively meet the challenge of environmental and economic sustainability. Focusing on organizational behavior and culture can accelerate technical change to a much greater extent than targeting just individual behaviors.

In corporations, the energy manager plays a key role. But the ultimate behavior change target must be mission managers and the corporate management level (c-level). In the more traditional techno-economic model, the energy manager typically assesses the technical aspects of the energy system, identifies opportunities to create efficiencies that will pay for themselves through energy cost reductions, and presents a proposal to "sell" a plan to the c-level, promoting the energy dollar savings and the rate of return on the investment. These investments typically must compete with other organizational investment opportunities with multiple returns. The history of energy efficiency programs suggests that energy managers are frequently unsuccessful because the "sales package" is not well developed, energy managers are not necessarily skilled at marketing upper level management, and the arguments may get fuzzy as the proposal moves through the organization and as non-energy managers present summaries of the proposal.

Further, C-level executives may not believe the promised cost savings and may be uncertain of energy project benefits relative to the mission of the organization. Energy managers will tell you that they have drawers full of unfunded energy projects because these projects were not seen by management as central to the organization but rather as non-essential add-ons that failed to align or translate well to organizational mission [See Box 2].

2. Energy Efficiency and Integration of Mission

As part of its mission, the Federal Energy Management Program initiated discussion with Customs and Border Protection (CBP) to find ways to reduce energy. The CBP uses significant amounts of energy to light the border area. While the arguments for increasing the efficiency of lighting along the border to save energy and cost were of interest, they became much more compelling when it was recognized that new efficient lighting would increase visibility and the ability to detect persons within the border zone, contributing to the overall mission of the CBP.

A way around this is to harness organization mission self-interest to accelerate and increase the scale of adoption of energy efficient and renewable energy technologies. Energy manager behavior is still central but understanding and effectively operating in the organizational context is also critical to success. This approach requires a deep understanding of the organizational mission and c-level priorities.[3] The energy manager uses this understanding to identify selected leverage points within the organization context and to align and prioritize energy goals with those of the mission. The energy manager develops the key habit of becoming a collaborator with mission action owners. Thus, energy management considerations can be systematically integrated with, and driven by, the organization's mission, goals and objectives, and priorities both current and future. Done well, energy management evolves from creating and attempting to implement episodic programs to inclusion in a mission driven culture of sustained organizational change.

Using Social Processes to Accelerating Change

Aiken and Keller (2009), in a review of the efficacy of organizational change management since 1995, judged major change initiatives to be successful just 30 percent of the time despite the myriad resources available to aid organizations in achieving results. Part of this may be due to a lack of understanding of behavior, the primary role of behavior and social interaction in creating and sustaining groups and organizations, the socialization of individuals into groups, and why individuals or groups may resist or embrace change. With a fundamental understanding of behavior and social processes, it is easier to understand how to analyze organizations, where to intervene, and how to intervene to create change.

Basic Social Processes: From Individual to Collective Behaviors and Culture

A recent publication argued that the solution to climate change involved transforming the behavior of the world's population, 7.5 billion decision makers (Figueres, 2017). This is true, but in its most literal interpretation it ignores the behavior of groups, organizations, corporations, governments, etc. Individuals in groups act collectively and groups can interact collectively such that the impact of their behavior is much greater than the sum of individual behaviors. Groups and organizations are important integrators and amplifiers of individual behaviors. Firms, organizations, and governments interact with each other in ways that further amplify behaviors [See Box 3].

At its most elemental level, individual behavior is the response of an organism to its own internal states or to stimuli from the environment. Internal behaviors take the form of neural or motor responses while the stimuli may be reactions to the physical and/or social environment, interactions among people, and responses from others to our physical or social selves.

[3] Most energy managers are not well suited for this role suggesting the need for rethinking the role, the attributes of people occupying the role, and training that may be needed.

Social interactions lead us to understand who we are, why we behave the way we do, why behaviors become repetitive, and how collective behavior leads to the rise of group and societal culture. Mead (1934) observed that humans behave and observe the responses of other humans to their appearance or behavior. If the feedback from another is "accepting," then the behavior is likely to be repeated. If it is "rejecting," the human might be disinclined to perform that behavior or decide to engage in a different behavior. Iterative behaviors and presentations of self shape how others see us and respond and how we subsequently see ourselves and behave. Because behavior occurs in social context, what we see and how we perceive is cognitively biased leading us to tend to limit our options. Similarly, when interacting with physical objects, a person may deduce that he or she is a pianist, a computer geek, or neither.

When interacting in social groups, people develop shared mental representations, concepts, and language common to the group (Berger and Luckman, 2011). The military has its own distinctive way of interacting with its members, as do accountants, energy managers, and other specialized groups. More recently Cialdini (1993; 2015) has elaborated on the importance of behavioral social interactions as an influencer of human activity.

3. The Power of Collective Action and Interaction

It is changes to collective behaviors that are required to achieve needed massive impacts. An individual like Elon Musk can build a car, but a corporation like Tesla and its employees can build hundreds of thousands of cars (Funk, 2017). Tesla electric cars and advanced batteries seem destined to significantly influence the automobile market and how energy is stored. Volvo, now a Chinese company, likely responding to Chinese environmental imperatives, recently announced that they are going to stop building fossil fuel only cars and switch to hybrids and electric vehicles by 2019, providing an affirmation of a future for automobiles that is far different from the present and may motivate others to move ahead faster (Ewing, 2017). GM, which along with others "killed the electric car" (Paine and Deeter, 2006) but has since built the Bolt EV and the Volt, announced that it will release in China at least 10 models of all-electric vehicles by 2020 (Lambert, 2017a) and 20 models by 2023 (Hawkins, 2017). Ford has announced that it will intensify its efforts by creating "Team Edison" (Buss, 2017).

These private sector efforts have occurred as the governments of China, Norway, and others have adopted regulations to address economic and environmental issues, particularly the threat of global climate change. China is looking to ban fossil fueled vehicles outright (Starr, 2017). Norway has announced a complete ban on fossil fuel power cars by 2025 (Staufenberg, 2017). Automobile companies have resisted or are resisting regulations but are also hedging their bets by recognizing the competitive threats (Lambert, 2017b).

Informal and formal rules are learned or arise out of recurring behaviors and constitute an aspect of group culture. People assume different roles in groups creating formal and informal social structures. The group may create rituals that affirm the group, create solidarity, and differentiate it from others. Basic ways of organizing may be borrowed from the larger culture. A group can create a "worldview" about where it fits or not based on interactions among its members and exchanges with other groups and the larger culture [See Box 4].

4. Different Understandings of the Same World: A Fleet of Buildings or Just Buildings

We tend to see what is and tend to ignore what might be. Utilities try to encourage efficiency upgrades in the commercial building sector with the goal of upgrading as many buildings as possible. Utilities organize their service territories geographically based on circuits and feeders. The "natural" strategy is for customer service representatives to go building by building within their geographic area to sell "their" engineers efficiency upgrades. An interested building engineer might work with the customer representative to develop a proposal which then makes its way through several layers of organization to key decision makers. These decision makers have multiple priorities focusing on such things as capital appreciation rather than expenses, buying buildings, renovating buildings, selling buildings for a capital gain, keeping the building leased, etc. The proposal may not fit with the chosen strategy of the decision-makers and get rejected or delayed.

Building owner or management companies may have a fleet of 20 or 30 large buildings and deal with 8 or 10 customer service representatives at a given time. If the utility reconceptualizes its service territory thinking about owners and operators of fleets rather than a building on a circuit, then the target is top level corporate level owners and managers and it becomes much easier to align the utility and commercial building owner goals so that they reinforce one another resulting in faster and more gains in efficiency.

Prospective members learn who is in and who is out, the formal (stated or written) and informal (commonly understood) rules of the group, and the structure of the group (who's on first), and they become partially or "fully" socialized to these. Socialization occurs both through interaction within and feedback from outside the group, including responses to behaviors and cues from others that tell one if his or her behavior is acceptable. Socialization takes place along a continuum from informal to formal. The informal includes those things that one is expected to do but not codified in formal rules, regulations, or laws. These are passed along through oral tradition and example. The formal includes the legal rules, regulations, protocols, and practice manuals that are codified and that may require training -- for example, course work, passing an exam, getting a license, and periodic education to maintain one's standing. Formal rules may not always be followed, and informal norms and processes may grow up as the formal changes [See Box 5].

Individuals have multiple group affiliations. The process in each group is much the same as previously described but a person can belong to groups with various worldviews. An individual can compartmentalize their beliefs and, for example, belong to a religious group that holds the theory of evolution suspect while concurrently working in a research laboratory where the theory of evolution underlies advances in cancer treatment. This cognitive dissonance can be ignored, accommodated, or exist for long periods of time without being resolved because of multiple motivations taking precedence in different contexts (Festinger, 1957).

Socialization of new members into groups is never truly complete. There are almost always missing pieces in the socialization process. When a member experiences a failure of socialization, others may overlook the failure, attributing it to not understanding, to being new or young, or to some other cause. Group members who are not adequately socialized or who consistently violate the norms of the group, may receive verbal and non-verbal cues that indicate that they have transgressed the norms of the group. As a result, they may be punished, shunned, marginalized, and/or expelled from a group (Homans, 1950). For example, modern Protestantism is a history of schisms within denominations resulting in new religious groups (Weber, 1930).

5. A Potential Case of Emerging Culture

Recently, a Marine sergeant in an artillery battery pointed out that there were many gaps in what transportation specialists are taught and these gaps are filled either through things learned from Marines in the field (socialization by the "old" timers) or through the development of adaptive behaviors. This young Marine described several things that transportation Marines need to know and related that she and her counterpart developed a power point presentation and trained Marines on local best practice. Thus, desired new behaviors were defined and a potential new institutionalization process begun. It would be interesting to know if in the case of this unit, whether the new local practices can survive the rotation of the Sargent and remain a part of the local unit practice. Further, could the adaptive response be institutionalized across the Marine Corps given it's organizational culture?

New members may bring new behaviors, norms, and values to the group. These behaviors are tested by the group. It is not just new members who cause change within the group. It is more typically an outsider who is marginal but known to the group and respected by a core member who injects the outsider's ideas or suggests ideas that the group adopts (Granovetter, 1973).

Groups create, perpetuate, or change their culture. The important point is that group behaviors are constructed, maintained, or changed through social processes. In order to change individual, group, and organizational behaviors, rules and structures may have to change.

At this point it is useful to think about culture. Culture is the formal and informal norms, rules, laws, ways of doing things, beliefs, values, and attitudes as well as intellectual and physical artifacts, blood oaths, music, art, literature, and machinery, that arise from group behaviors. It is an emergent symbolic glue that loosely or tightly provides a rationale that binds participants to the organization [See Box 6]. Culture may vary at different levels within the organization. It is a product of the interaction of people in groups or groups within groups who develop norms and accepted ways of acting and thinking. Groups and organizations may disregard, modify, or add elements to advance their own goals. Organizations may also create ways of doing things, beliefs, and values that do not align with commonly accepted values and norms, sometimes maladaptively (e.g., ENRON) or in an exceptional manner (e.g., Mayo Clinic, ACLU).

6. A Cultural Values Driven Organization

The Good Samaritan Society is a not-for-profit faith-based organization that provides senior care and services in 24 states serving some 30,000 people. The organization established up a set of seven values -- perseverance, compassion, courage, humility, acceptance, honesty, love, and joy -- by which they operate. These traits are constantly called out at meetings of the boards, staff, residents, and clients of the facilities. They inform decision-making and relationships. Behavioral exemplars are frequently publicly acknowledged. The staff, residents, and clients appear to have more positive relationships than in similar organizations.

There are several processes that produce culture and culture change. Culture can be transmitted, learned, created, or devolved. Because culture is a product of social interaction, there may be errors in the socialization process that result in behaviors that are either lost or become institutionalized. Secondly, there may be gaps in the socialization process that result in individuals or groups developing adaptive responses. It should be noted that such adaptive responses can have neutral, positive, or negative impacts on organizational functioning at any point in time or over time. An organizational culture may, or may not, have formal mechanisms for judging the value of such adaptive responses. Informal cultural mechanisms may encourage or discourage adaptive responses. A lack of formal and informal mechanisms can result in lost value through the underutilization or loss of positive adaptations or in a worst-case scenario, the institutionalization of negative adaptations.

Importance of Organizational Context

As stated, all organizational change is based in social processes. Further, social processes occur within organizational contexts that enable, hinder, or even prevent desired change from occurring. A solid understanding of organizational context is fundamental to development, initiation, and sustainment of change.

A baseline description of organizational context is usually derived from examination of the public documentation associated with the organization. This documentation would include

mission statements, strategic plans, organization charts, and performance reports. Further descriptive material may also be gathered from external assessments of an organization relative to its peers/competitors.

To facilitate significant change, descriptions of formal organizational context must be enhanced through analytical processes (e.g., social network analysis (SNA)) that provide insight into the culture and dynamic functioning of an organization [See Box 7]. Such an analysis would necessarily include understanding informal culture (i.e., the way things really get done), cross-functional collaboration/integration, ability to assess risks/opportunities, agility/rigidity when confronting challenges, and how formal culture is operationalized through organizational and individual behavior. Understanding socialization processes, patterns of influence, informal networks, infrastructural limitations, weak or missing functions/linkages, etc. that frame and influence decision-making processes is critical to developing effective approaches to organizational change.

7. Precision Targeting with Social Network Analysis

Some years ago, SNA research was done on networks associated (Reed, et. al., 2004) with retail building construction. Major retailers have groups of collaborators (networks of companies) with whom they consistently work to construct new or refurbish existing stores. The members of these networks sometimes locate near the retailer's headquarters. Such a network might include a regional or national retailer; a developer with multiple national or regional retail spaces; an engineering firm or firms that do structural engineering, electrical, and/or plumbing; an architectural firm that specializes in space planning; an architectural firm that does branding design; and usually a local architect to interface with local planners and zoning and code officials. Except for the latter, a team could be responsible for building hundreds of retail spaces throughout the country over a period of years. By focusing on these teams, promoters of energy efficiency could influence the efficiency of hundreds of stores. Efficiency has been largely funded by utilities and state and local organizations, and there has not been a national organization funded across jurisdictional boundaries with sufficient resources to target these networks. Thus, the potential of targeting these networks has largely gone unrealized.

Organizational Change Frameworks

This section addresses frameworks for understanding and implementing change. As the reader will discover, they are all based in the social processes described above. Principles or strategies for creating change are discussed first. When analyzing a situation, it is useful to think about where and how these principles might be used. Next, a discussion of organizational roles, rules, and tools provides a framework for applying the principles. These are key concepts for analyzing an organization and identifying where change efforts can be best focused. Finally, a

discussion of a process to improve decision-making (The WRAP process) and changing ingrained habits is undertaken.

Principles (Processes or Methods) for Creating Change

Drawing on management science, social psychology, and behavioral economics literature as well as original survey and case study research, Malone, et.al. (2013), identified eight social science evidence-based principles to guide institutional change efforts supporting the Federal Energy Management Program at the United States Department of Energy. These principles reflect a basic understanding of sources of behavior and culture change and represent a guide for inducing change. Not every principle applies in every situation or to the same degree and users must select and apply the principles to their situations, informed by organizational analyses.

The principles are:

- **The Social Network and Communications Principle:** Organizations, groups, and people establish networks interacting on a regular basis within and without an organization and in the larger social milieu. Networks arise everywhere. They represent a powerful way to spread behavior and ideas.

  William H. Whyte, Jr., writing in *Fortune* in 1954, analyzed and illustrated the spread of air conditioners in Philadelphia Row Houses (Whyte, 1954). Diffusion was not random but rather exhibited a very clear pattern of spread among clusters of interacting neighbors skipping others not socially connected. Rogers (2003), an observer of the spread of farm practices and many other innovations, wrote about the spread through broadcast and contagion processes. Broadcast methods (hearing about something through one-to-many sources like newspapers and television) are much less effective in spreading behavior and ideas than contagion (the spread from person to person through networks). Bass (1969) and Mahan (1985) developed models that encapsulated these ideas that are now widely used to predict the spread of innovations. Granovetter (1973) documented the movement of ideas and behaviors between networks through weak ties.

  Social media is an example of the power of networks. Someone sends a link to friends. Selectively, friends send the link to their friends and on and on. The good news (idea or behavior), the bad news, and the fake news all spread quickly. Once the behavior or idea gets into the network, it is very difficult to stop and almost impossible to retrieve.

  Utilizing Social Network Analysis (SNA) methods and tools (Scott, 2017), one can figure out where within the organization to inject ideas and promote new behaviors. By looking for network linkages outside the organization, ideas can be spread externally, as well as brought into an organization.

- **The Multiple Motivations Principle**: Institutions and people almost always change their ways of doing things for more than one reason. When designing organizational change initiatives, it is critical to understand the mission motivation for desired changes from multiple perspectives. Theoretically, the organization mission should be a unifying motivation for all members of an organization [See Box 8]. Ideally leaders strive to create an organization within which each employee understands how their efforts contribute to achieving mission success.

  As discussed, the motivations for corporate decision makers to engage in energy projects are often limited when project justifications are narrowly framed in terms of cost-benefit metrics, even when environmental compliance benefits are included. This can result in the broader set of project connections to corporate mission being obscured, treated as secondary, or missing from project justifications. These mission related motivations may potentially be of greater significance than cost benefit metrics.

8. Multiple Energy and Resource Benefits for Silicon Growers

In 1998, the Northwest Energy Efficiency Alliance funded a pilot project to improve the energy efficiency of silicon growers by adding insulation to furnaces used to grow silicon logs that are subsequently sawn into wafers and etched to produce solar cells. An additional goal was to transfer the technology to other silicon manufacturers (Reed, et.al., 1999). The key results were:

- Power consumption was reduced by 51 percent (kWh/kg produced)
- Cycle time per batch was reduced by 20 to 40 percent meaning greater productivity because more logs could be produced in the same amount of time
- Argon used to remove impurities was reduced by as much 85 percent reducing cost and waste
- Crystal growth yield improved by four percent due to fewer material structure failures meaning more logs and less waste
- Pot scrap (wasted raw silicon) at the end of the run was reduced from 4 to 1kg
- The quality of the wafers improved yielding an additional 0.2 amps or four to six percent improvement in output
- As a result, the company planned to redesign 40 additional existing growers
- Additional growers could be added at this site while avoiding a $500,000 expansion of the electrical substation.

This disconnect can change in several ways. External trends and forces can create new motivations for leaders in the form of competitive and existential threats, as well as new regulatory and legal requirements. These external pressures may compel leadership to engage in change initiatives. Change may also occur more organically. An innovative energy manager could demonstrate the importance of the energy program and projects by redefining

justifications in terms improving organizational outcomes and effectiveness tactically and strategically. (Connecting in this way may also create social networking/collaboration opportunities that multiply impacts.)

Forty years of experience in the field of energy efficiency suggests that there are almost always multiple benefits/motivations for energy efficiency practices. The tendency of energy utilities and government energy programs is to limit the rationale for energy efficiency to energy saved, energy cost reduced, and reduced environmental impacts. Other benefits, often labeled "non-energy benefits," are ignored because they are not assumed to have direct benefits for utility customers or program participants[4] or to stated missions of utilities and government agencies. The label "non-energy" is a negative framing that adds to the potential that they may be dismissed, overlooked, or challenged. Given the discussion of mission motivation, it is not difficult to understand this tendency. The challenge of accelerating energy efficiency is for utilities and government to understand and align to broader multiple motivations of organizations and individuals.

This paper is focused on organizations, but alignment with individual motivation is also critical. Dan Pink (2009) points to three primary factors that motivate high performance: *autonomy, mastery, and purpose.* Humans have innate desire to direct their own lives, learn and innovate, and to connect and contribute to a greater good. Change initiatives should be designed to tap these motivations. Additional individual motivating factors may also be present, including private behaviors of recycling, public transportation use, volunteerism, and environmental activism, among others. These too may be useful to build into change initiatives.

- **The Leadership Principle**: Institutions and people change because visible leadership communicates management commitment to visible workplace behavior change. Changes to rules, roles, and tools beget new behaviors. But leadership must call attention to these and reinforce them. People will then practice and learn these new behaviors. They observe others practicing new behaviors and they either learn new behaviors or their own new behaviors are reinforced. Group members communicate among themselves about new behaviors, reinforcing it while adapting existing or creating new norms.

  Leadership is important in gaining acceptance and adherence to change. Written and oral communication about a change has its place but more important are the cues and behaviors of leadership relative to a change. Cues that leadership does not think a change is important can quickly undermine change. Announcing a change and then assigning a low-level employee to manage the change sends a message. Assigning implementation of a change to an upper level, but overworked, employee and/or failing

[4] Studies of non-energy benefits are sometimes undertaken when it is recognized that a program may have multiple objectives. Because it is defined by law as both a social and an energy program, the National Low-Income Weatherization Assistance Program analyzes non-energy benefits such as improved health.

to provide resources for follow through sends a message. But, perhaps most important is that leaders must assure that their own behavior and attitudes reflect what they are asking of the rest of the organization [See Box 9]. It is the observable behaviors and how they are interpreted by groups and subordinate parts of the organization that count. People within the organization interpret and then spread and amplify their positive or negative interpretation of the message.

9. Keystone Habits of Successful Organizations

In "The Power of Habit", Duhigg recounts the story of Paul O'Neill, CEO of Alcoa from 1987 to 2000, who turned a floundering company into one of the greatest successes of the period. At his first meeting with the financial press and investors, O'Neill dumbfounded them declaring his approach to turning around Alcoa was to make it the safest company in America. By the time he retired he had accomplished this goal, increased the company's annual net income by five times, increased its market capitalization by $27 billion, and raised Alcoa's stock price by five times. O'Neill chose worker safety purposely because no one in the company could argue that it was unimportant. As well, worker safety enabled all employees, from top executives to the lowest ranking line workers, to engage in the change process. O'Neill gave everyone his phone number and encouraged them to call him if they had a safety concern. Without exception all safety incidents, along with a plan to prevent the incident from ever happening again, had to be reported to the CEO through the chain of command. The plan required quickly analyzing the process in detail and proposing changes. Change rippled through Alcoa to meet the safety imperative. Improving worker safety conditions resulted in collateral process improvements, increased worker morale, and empowered workers to make suggestions for improvements beyond safety. Paul O'Neill's leadership extended beyond words to visible personal involvement in supporting systemic change that established principles and values that resulted in a culture of safety that left no doubt in anyone's mind as to how the company would behave.

- **The Commitment Principle:** Organizational change requires short- as well as long-term commitments to maintaining or renewing change at all levels within a group or organization when those commitments relate to future conditions such as making arrangements to "save more tomorrow." Commitment has been defined as a "positive intention to take some action (Sanagorski and Monaghan, 2013 as cited in Martin, 2015)." This definition might better be shifted to engaging in a behavior or behaviors that affirm an action or an idea. Intent frequently is not visible or may be only intuited but not observed by others. As a result, there is no feedback to the person making the commitment or social support from the group. Martin (2015) in summarizing the literature suggests that there are public, group, and private commitments. Change that is publicly enacted or involves group behavior is more likely to result in lasting commitment and behavioral consistency over time than is private behavior change (Stults and Messe, 1984).

This brings us back to the idea of self-image discussed earlier. Cialdini (2001, pp. 80-81) says that "the commitments most effective in changing a person's self-image and future behavior are those that are active, public and effortful." In other words, effective behavior change is more than thinking about something or making a pronouncement, but doing something publicly, in a way that takes effort, and under low reward conditions so that the individual must take inner responsibility for it. Cialdini provides examples of the link between behavior and commitment. Direct sales organizations such as Amway have customers write their order rather than the agent because they get fewer cancellations or returns that way. Through initiation rites, fraternities and sororities gain commitment to the organization by having potential initiates go through a great deal of trouble or pain to gain membership as opposed to behavior requiring low levels of effort. Of course, those who fail to comply do not become members while those who do develop strong bonds with the organization.

The key to this is to get people to own what they have done. People will then behave in in a changed but consistent way in the absence of social pressures. "Social scientists have determined that 'we accept inner responsibility for a behavior when we think we have chosen to perform it in the absence of strong outside pressure'" (Cialdini, 2001, p. 82).

In terms of organizations, sustained change requires leadership to make or support changes in the social structure, the social fabric, or the rewards of the organization that allow or elicit new behaviors. Leadership must demonstrate commitment and act out that commitment publicly.

One way of doing this is to report action against principle. Many organizations report on their sustainability actions. This requires laying out metrics and then making measurements that support progress against the metrics. From the perspective of energy, these metrics need to go beyond reporting energy saved and cost benefit calculations to encompassing broader mission metrics that can drive energy efficiency efforts.

- **The Information and Feedback Principle**: Institutions and people change because they receive actionable information and feedback. It is quite widely believed information is sufficient to drive change. Many programs, government programs included, are predicated on the idea that information is sufficient to spur action. In some cases, information does cause someone to act. A successful information-only program, such as a mailing, might yield a three percent response in a broad population.

  A key word is "actionable." Telling someone they can save money if they replace their inefficient lighting might provide sufficient motivation to get them to do it. But additional information may be needed to take motivation to completion and repeated action -- e.g., what efficient lighting is, what one needs to know to select it (Are the criteria the same as for older lighting?), whether it will fit existing fixtures, where it can be purchased, how to write a specification for it, and what other benefits may accrue.

In 1964, Everett Rogers wrote the first edition of *Diffusion of Innovations* in which he describes characteristics that enhance the diffusion of new ideas and products. These characteristics are: other types of relative advantage beyond just the economic, compatibility with the socio-technical system, minimized complexity, trialability, and observability. Recall the earlier discussion about interactions between people and objects. Note the last four characteristics relate to how users and potential users behaviorally experience and interact with new ideas and objects.

Associating a product with something distinctive can hasten its uptake. The relatively quick adoption of the Toyota Prius Hybrid has been partly attributed to its distinctive shape (Davies, 2015).

A frequent problem is that outcomes are not always readily visible. For example, energy efficiency is often not observable although one may see physical objects associated with it. To address this problem, a graphical representation of the actual or expected benefits may be displayed. Graphics are often found at the gate of industrial and other facilities showing reductions in electric usage or reductions in accidents. As employees enter or leave a facility, the feedback serves to reinforce/discourage current behaviors or encourage new ones.

- **The Infrastructure Principle**: Institutions and people change because a changed infrastructure makes new behaviors easier and/or desirable. Infrastructure includes both the physical infrastructure and social and cultural structure in which organizations are embedded and surrounded [See Box 10]. Architecture may lock in certain patterns of behavior and interaction. For example, it may limit contact among groups or it may communicate something about the perceived status of groups or individuals within an organization. Likewise, the design and layout of industrial processes may inhibit or facilitate social interactions within and the efficiency with which the plant operates. Simple design changes to apartment doors, setting the door back a few feet from the corridor can increase the safety for residents and their guests (Newman, 1972). Aelbrecht (2015) writes about well-designed public spaces that

10. Changed Location – Changed Social Patterns

When the military disallowed smoking by isolating smokers to a specific area in a building or sending them outside, communications patterns changed. Smokers throughout the organization self-selected and congregated outside the building at specific times where they formed new social networks and proceeded to exchange information. This produced an unintended effect: new communication paths that bypassed the usual hierarchy within the workforce. Some managers then had less control over the dissemination or receipt of information from their part of the organization, often to their chagrin.

are “sociologically open . . . breaking the ‘placelessness’ and ‘fortress’ designs” bringing strangers together.

Similarly, the social structure of an organization may influence the potential for stability or change. Social structure may constrain which interactions take place and their content. Hierarchy may make it difficult for personnel to communicate more than a level above them. Perceived status may cause some persons to be less or more vocal.

The important point is that both the physical and social infrastructure needs to be examined to understand how they may inhibit or encourage desired behavior. Making changes to infrastructure is an important tool for changing organizations. Changing the organizational structure can create new patterns of behavior especially when coupled with changes to norms and rules. Physically relocating elements of an organization (e.g., to a new “green” building) can lead to new behaviors and new patterns of interaction. Utilizing choice architecture, such as changing defaults in procurement software, or opt-out approaches, can be effective infrastructure changes.

Changes to organizational structure are not always positive. Not infrequently leaders have changed social structures and physical infrastructure to address conflicts among members of the organization. For example, groups may be divided and personnel in conflict assigned to different groups. This may reduce the conflict, but it may have other consequences such as misaligned talent.

The Social Empowerment Principle: Institutions and people who feel they can reach desirable social goals often do. There are multiple parts to this including having attainable goals and processes that allow people to participate in setting and helping to reach goals, motivating participation in the process, and rewarding the response.

A number of utilities have helped industrial customers to implement employee empowerment programs around industrial energy efficiency. These programs have typically involved a program kick-off, working with employees to establish some goals, providing employees with examples of what might be done, encouraging work groups as well as individuals to come up with suggestions, and establishing physical boxes or software solutions to collect suggestions. Implemented suggestions are made visible to employees, and perhaps feedback and rewards are made to individual employees, groups of employees, or all employees if the suggestions have widespread impacts. Interviews at two utilities that have implemented engagement programs at several industrial plants have reported results that are striking with high participation rates. This was the case in one program when employees saw the empowerment program as helping to save their jobs and their community.

If not well designed, empowerment programs can have perverse outcomes. Some engagement programs have produced so many suggestions that it was not feasible to evaluate and implement all of them, discouraging further participation. Rewards and benefits seen as going to managers and shareholders and not to employees have also

discouraged participation. There are cases where employees have withheld suggestions because they thought they might be able to patent ideas and receive rewards from outside the organization. And, there are instances where employees have initiated improvements on their own in response to empowerment programs, outside of official channels, such as making subtle changes to a control system, making it difficult to assess the effects of the program.

- **The Continuous Change Principle**: A successful single intervention at an industrial facility can significantly improve energy efficiency. However, long-term sustainability requires more than a single intervention and a celebration. Continuous change is a habit of the organization or individual(s) at all levels constantly scanning the internal and external organizational environment, identifying interventions that improve the ability of the organization to advance its mission and goals, assessing the efficacy of proposed changes, implementing the changes, measuring the outcome of the changes, and then repeating the process. The goal is to instill the habit of constantly searching for and implementing improvements. Visually the continuous change principle is somewhat analogous to a spiral binder placed at an inclined angle. The rings of the spiral represent the continuing process and the incline the improvements toward the mission and the goals. The goal of the overall effort is to build upon preceding change and continue the process rather than to simply repeat what has already been accomplished and create another one-off project.

  The key here is to make the leadership and the members of the organization aware of the change process and motivate them to accept, participate in, be rewarded for participation, and continuously improve the process. Change rather than stasis is the new normal.

Roles, Rules, and Tools

Roles, Rules, and Tools (RRT) are an outgrowth of the basic social processes of behavior and culture previously described (Wolfe, et.al., 2014). Groups and organizations inherit (perhaps selectively) organizational forms and ways of doing things from the larger culture or the existing organization. Through social processes they selectively maintain, adopt, adapt, add, or subtract from these. To understand where and how to effectively create change, one must analyze and understand the organization's structure as embodied in roles, rules, and tools.

Roles

Roles represent the functional authority for behaviors within an organization or group. When examining groups, we often ask who (by name) plans, who makes decisions, and who implements. Getting to the specific "who" is one way of identifying roles but the concept of roles is broader than determining the name of the current incumbent in a position. Roles exist independently of the named individuals who occupy them. Role definitions establish the authorities, responsibilities, and degrees of freedom to act for individuals occupying roles.

One place to start identifying key roles is to examine an organization chart. One can identify important positions and associated roles. The analyst needs to be wary because formal definitions of roles in an organization chart may not mesh with the on-the-ground content of the roles. Role incumbents may rigidly embrace, shy from full commitment, or push beyond the boundaries of the formal role definition. There may also be informal roles that do not appear on an organizational chart. These informal roles may provide the grease that helps the organization function. Observations and interviews along with a network analysis are needed to verify and uncover what the roles are, who the incumbents may be, and how they collaborate.

Roles are about who is responsible or who can influence or determine specific behaviors or functions. The first text box "*Collaboration and Accomplishing the Mission,*" points out how the missions associated with roles can compete or collaborate. In that scenario a savvy energy manager could recruit the marketing manager and collaborate to reduce energy costs while improving aesthetics and marketing effectiveness of the store. Recognizing the importance of different roles and establishing collaboration among individuals representing those roles is an impactful change strategy. Failing to do this can slow or hinder a change effort.

Rules

Rules, in contrast, are the established ways of doing things. Rules can operate to block, slow, or accelerate change. An analysis of rules is needed to understand what the rules are, where rules may need to be modified or removed, or where new rules may need to be added. Formal rules are typically written to state acceptable behaviors and default choices. Examples of formal rules are policies, executive orders, personnel guidelines, purchasing requirements, and travel regulations. There may be explicit penalties or sanctions identified for disregarding the formal rules.

Informal rules are unlikely to be written but have been passed among the members of a group or organization, are generally known to members, and may be equally as accepted and followed as formal rules. In the absence of formal rules, participants often operate based on examples of processes or decisions previously made. Informal rules are often passed on by patterning behavior after the behavior of colleagues and/or through oral traditions.

Both types of rules can be enforced through informal social sanctions administered by members of the group. They may be prefaced by statements like "this is the way we do it here" or "do it this way." Formal rules may be modified or restricted through practice and become inconsistent with their formal expression or initial intention. It is not unusual to find that the formal rules are not what they are thought to be.

To foster change, it is important to ask what policies, procedures, and norms support or inhibit desired new behaviors are present or absent. For example, are there purchasing rules that may require low bid versus life cycle cost? Are budget categories structured in such a way that

trade-offs between equipment and labor cannot be made? New lamps may have much lower maintenance costs that offset higher first cost, but maintenance labor costs may be in a different budget line and be the responsibility of someone else and therefore not available to offset the higher first cost.

Only some rules may need to change. The analysis can proceed by assessing adherence to the formal rules through interviews or observations to determine how the rules operate in practice. Interviews and observations exploring the formal rules aid in the discovery of informal rules. A best practice is to literally or figuratively walk through a process, identify the rules, and how they are applied. Different decision makers may focus on different rules, and they may know the rules they apply and the rules one level above or below them but not beyond that. One cannot assume that formal and informal rules can be identified by talking with a few decision makers. Therefore, it is important to learn what the rules are and how they are applied at different times throughout a process and not initially accept what is said about rules outside the immediate purview of a person responsible for a specific step in the process.

Rules and the results of applying them may not fully align throughout the organization. In a recent study (Shields, Sadlier, and Wolfe 2016) , Marine Corp planners followed a set of rules and models for supplying forward operating bases (FOBs), but leaders on the ground at the FOBs had a set of rules with different priorities. The two sets of rules did not always mesh resulting in inefficient allocation of resources such as having too many or too few vehicles and drivers to support a critical mission.

It is also important to ask why the rules exist. Rules may have multiple purposes or they may serve no current purpose. Circumstances change and there may no longer be a reason for a rule. Equally important to the analysis of rules is to ask if new rules might be useful and what those new rules might be. It is also critical to understand the formal and informal processes related to changing, eliminating, and creating rules when needed.

Tools

The mention of tools typically suggests physical objects such as saws, hammers, rulers, pliers, and maybe calculators, computers, and associated software. Here, the term “tools” is used more broadly. It connotes both physical and non-physical objects. Tools are cultural artifacts: the technologies, processes, and systems that are in place to support the goals of an individual or organization. Tools can be a stumbling block that contributes to “business as usual” behavior. Adapting, eliminating, or adopting new tools can accelerate change.

Typically, tools lock in the cultural context for the era in which they were developed. In the 1970s and 1980s software tools, such as billing systems, coded dates as month, day, and a two-digit year. This made sense because it saved costly digital space and processing time, but it created the Y2K crisis when these tools could not differentiate between the 1900s and the 2000s. As a result, enormous funds were expended to rewrite the software codebase, in many instances in a language, COBOL, that was for all practical purposes dead.

Until well after the turn of the century, many utilities continued to buy and use $30 meters, had meter readers visiting individual customer sites, and used legacy software and hardware to do account billing. This made for inexpensive transaction processing but it impeded the ability of utilities to know about their customers and how their customers used energy. And, it was a cultural support for "business as usual" that presented an obstacle to experimenting with alternative models for utility-customer relationships.

An employee's identity, reputation, and competence may become associated with the knowledge and use of specific tools. As a result, members may resist changing or replacing a tool because they are insecure about how that might affect their role and identity, or that it might require effort to learn new skills. We have seen this in many situations, for example: a plant engineer resisting a change to a process by arguing to management that it won't work; a building engineer refusing to use a new monitoring system explaining they do not have time to support it; a logistical planner, knowledgeable about how to load a specific type of transport ship, refusing to share that knowledge because of its implication for their job; IT personnel sabotaging tests of a new system by claiming that it didn't work because random words were placed in text fields during the test rather than normal content. It is important to recognize the relationship between tools and tool users and manage the change process so resistance to change is minimized.

Examining the tools in the organization to understand their cultural content and determining how leaving them alone, changing, or removing them can facilitate change. Changing a tool may have significant consequences for the organizational structure. For example, digital meters may reduce the workforce that collects and processes the meter data, making it possible to gather more detailed customer data more frequently. To further benefit from this, management would need to add or retain employees capable of sophisticated data analysis . The change needs to identify the tools: hardware, software, schematics of processes, and perhaps most importantly the undocumented and often hidden mental models of how the organization works. The change agent may then want to construct a model for how changing the tools might affect how the organization works. Attention must be given to how the users will respond to the new tools and how those tools might be misused.

The WRAP Process

Chip Heath and Dan Heath (2013) developed the practical four-part WRAP process, to help overcome common flaws in individual and organizational decision making identified in the social science literature (e.g., Kahneman, 2011). The four elements are: **W**idening your perspective, **R**eality testing assumptions, **A**ttaining distance before deciding, and **P**reparing to be wrong.

A common mistake is to frame a problem too narrowly. This is often attributable to reliance on past experience and immediately available knowledge in selecting alternative actions for consideration. Narrow framing leads to overlooking options. There are many ways to widen options [See Box 11]. Organizations can look within and find bright spots where units are already solving a particular problem. They can look around and find best practices in other organizations, being careful to account for contextual differences. Context matters very much and the same effort in one context might fail in another. One can also look for analogies from other domains. For example, a hospital might look at what is being done in office or industrial settings where there are clean rooms.

11. Widen Your Perspective

Think about the decision to build a new hospital. One could build on the historic image of a hospital and add new technologies. One could also ask how the practice of medicine is changing. Cancer therapies (as well as many other types of therapy) can now be administered in doctors' offices. Clinics are being moved into smaller buildings closer to patients. Patients are being discharged earlier. Advanced technologies such as smart watches and fitness apps are providing more and timely data that may change the need for certain types of testing and shift reactive treatment to proactive prevention. Patients can be responsible for their health longer and with better outcomes. These advances will dramatically change the nature of what doctors and hospitals do and how they do it, potentially rendering traditional hospitals to be anachronisms.

As we have already commented, reframing the terms "energy benefits" and "non-energy benefits" by combining them to be "mission benefits" might result in the inclusion of all mission related benefits which in turn might change the options considered by decision makers. While a utility sponsoring an energy efficiency program may not want to pay for all benefits, the customer may find that the addition of mission benefits changes their support from a lukewarm "interesting idea" to a "needs to be done" status or priority.

In any change effort, a priority should be to ask what the underlying assumptions are in the existing situation and in the anticipated change. This may require some outside assistance to see what the assumptions may be. Three useful questions are:

- What do we know and what we are assuming?
- How do we know what we think we know?
- How can we confirm our assumptions?

In assessing options, confirmation bias leads to collection of skewed, self-serving information. To combat this bias, ask disconfirming questions; zoom out (looking for base rates) and zoom in (seeking more texture); and conduct small experiments to gain further insight.

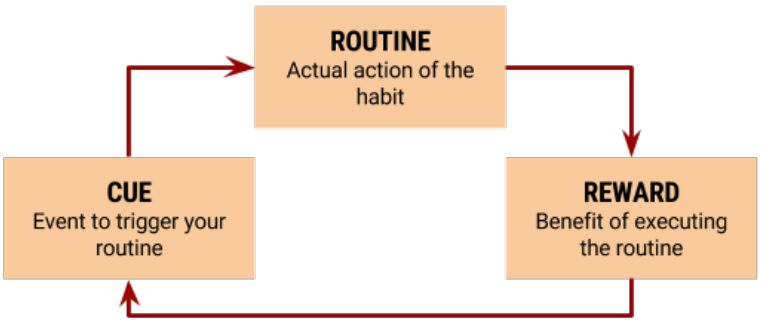
Short-term emotion tempts us to make choices that are potentially bad in the long term. To overcome this, shift the perspective. What are the long-term trends? Are they consistent with proposed solutions? What would the best organization do in a situation like this? Would the organization make the same decision five or ten years from now? How does this situation fit with the core values of the organization?

Humans are overconfident, thinking we know how the future will unfold when we really don't. There will be bad outcomes as well as good ones including those that significantly exceed expectations. What would cause reconsideration of decisions? Tripwires (metrics with thresholds) to snap us to attention at the right moments can be established. What contingencies can be developed to proactively position the organization to the broad range of potential outcomes?

The WRAP process, as with other change-oriented processes, must be applied in context to be effective.

Changing Habits

For individuals and groups attempting significant change, ingrained habits are one of the most difficult issues to address. Habits are a result of repeated socially reinforced behaviors. Habits reduce the mental or group processing required to respond to recurring situations. Duhigg (2012) defines a habit as "a choice we deliberately make at some point, and then stop thinking about, but continue doing, often every day." Duhigg provides a thorough analysis of how habits are developed and a structured approach to overcoming them. An understanding of how habits are formed and how they can be altered, extinguished, and replaced is needed for achieving effective change. Habits are characterized by cues, routines, and rewards. The framework for changing habits is to: identify the routine behaviors, the cues that initiate them , and the rewards that come from them. Experiment with alternative rewards to uncover their true nature. Isolate the cues that trigger the habit such as (1) location, (2) time, (3) emotional state, (4) people, and (5) actions and behaviors immediately preceding an event. Assemble the information and then plan an intervention that consciously substitutes one or more new cues and/or routines and establish an appropriate new reward. Repeating the new routine consciously will eventually replace the old habit with hopefully an improved one over time. It takes time to do the analysis and to establish the routine behaviors.



Source: Duhigg

Figure 2 The behavioral cycle of habits

Habits are usually thought of in terms of personal behavior, but organizations also exhibit habits, both good and bad. As was observed earlier, Duhigg demonstrated how the adoption of a key habit of safety by Alcoa CEO Paul O'Neill was instrumental in turning around Alcoa's performance, as a focus on safety had multiple positive co-benefits for cost reduction, productivity improvement, and employee morale. In contrast, bad habits that valued revenue generation over accounting integrity developed at Arthur Andersen and led to that firm's demise in fallout from the Enron bankruptcy which hurt not only Enron's rank and file employees, but millions of investors as well. Habits in organizations are embedded in informal and formal culture, and it is important to identify and enhance good habits while extinguishing bad ones.

Summary and Challenges

Social science research is continuing to expand the evidence base needed for development of new and more sound methods and tools for effecting change in organizations. The eight change principles and "roles, rules, and tools" framework, the WRAP process, and the habit change process are all grounded in social science and supported by research-based evidence. It is important to continue to monitor the research and to continually improve application of emerging knowledge and methods.

To effectively create and sustain change, it is necessary to understand organization and culture. In the quest to improve energy efficiency (and many other things) in our society, the tendency has been to focus narrowly on improvements to processes and technology that will produce the most cost-effective outcome. This limits the scope of change efforts and ignores the diverse ways and reasons an organization might have for pursuing energy efficiency and renewable energy and their complementary benefits. Without understanding the organization and culture, identifying the hooks to which energy efficiency, renewable energy and broader

sustainability actions are linked, it becomes very difficult to make energy and environmental sustainability fundamental organizational values.

An important set of activities is to understand and prioritize mission goals and behaviors. The goal for a hospital might be to provide high quality medical care to patients. But that goal is expressed in many forms: having and following protocols, getting the diagnosis and treatment right the first time, actively monitoring the patient, and ensuring that the right drugs and other materials are in the right place. Beyond that, purchasing and managing materials and drug costs efficiently, having efficient protocols for care, maintaining the environment for comfort and cleanliness, and having skilled staff are all required for managing the facility in the short- and long-term so that the demand, capabilities, and space are constantly in balance.

This requires the development of mission-integrated analytics. A technology-based energy audit can save energy. But such an audit misses many of the underlying sources of behavior enabling waste. Each of the requirements listed in the hospital example has energy use implicit within it. In addition to the technical audit, the energy burden of every one of these requirements can be examined. Physicians, nurses, purchasing agents, and other personnel can physically examine the piles of waste resulting from an operation [See Box 12]. They might ask how less could be used by changing the protocols, the way items are used, alternative purchases, and insisting on less or more efficient packaging and alternative disposal practices. At the same time, they must examine how alternative practices might improve the comfort and safety of patients. This is not a one-time but rather a continuing effort, perhaps led by the chief medical officer.

12. Collaborating to Reduce Energy Intensity

Hospitals use substantial energy. Initially, hospitals focused their sustainability efforts on reducing energy use. But some are now widening their options. They have started to track other sources of energy use such as the waste they generate and to recycle and reduce the use of certain products. They have engaged doctors, technicians, and nurses as mission collaborators and have established protocols that minimize the use of expensive tests and materials. They have found this not only reduces costs but, in many instances, it enhances the quality of patient outcomes. And, oh by the way, it reduces energy use throughout the supply chain.

What this does is transform numerous roles from narrowly framed program management to mission collaboration. A program manager's role is explicitly expanded to seek out and work with other key managers so that energy and sustainability considerations become integral to the mission.

The energy managers can leverage the action frameworks -- basic principles; rules, roles and tools; etc. -- to transform their responsibility to support mission effectiveness through collaboration with mission action owners. But to do so requires developing credibility and

support at the c-level as well as understanding who the collaborators may be and gaining credibility and support from them.

A most effective way to do this is to conduct experiments. Look around within the organization and find people who are interested in change. Find bright spots within the organization or best practices from like organizations. Work with collaborators to develop experiments around the bright spots. Get feedback from the experiments and then implement them, adapt them, or move on. Promote the successes and acknowledge the not-so-good results. Call attention to the behaviors, use social networks to communicate the results, and positive outcomes will result in greater willingness on the part of others to engage or to model behaviors. Beware of falling into the trap of assuming that sharing information is all that is needed. Information must be translated into behavior and action.

One can approach energy efficiency and renewable energy with a technology push approach (business as usual). This involves a narrow technology driven analysis and energy metrics driven actions. The result may be ambivalent decision makers. Or, one can approach it through mission owner collaboration and mission driven action with the potential for more depth and decision maker engagement across the organization.

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