Exploring Behavioral Change Theory

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ABSTRACT

This paper explores human behavior change from two constructs. The first is a staged transformational approach called the Transtheoretical Model of Behavioral Change (TTM). Under the TTM, individuals wishing to initiate and maintain a new set of behaviors move through five stages of change. The second approach employs a CSB (Cognitive-Structural-Behavior) Construct which suggests cognitive and structural outcomes result in behavioral change.

The TTM has been applied within the health and social sciences industry. Applying the TTM model to energy programs can identify both limitations in current program designs and opportunities for potential future improvements. The CSB Construct evolved from the application of the TTM to energy efficiency programming. The CSB Construct has also been used to simplify logic models relating to planned market transformation. Given the applicability of the CSB Construct to support program theory development across a wide range of energy efficiency offerings, the resulting logic models have been embedded in the *EM&V Protocols and Requirements of Ontario*.

By better understanding the process of self change, program managers and regulators can draft policies that allow participation from individuals not yet ready to adopt energy efficiency behaviors. Furthermore, evaluators employing the CSB constructs can establish metrics that track cognitive, structural, and behavioral outcomes towards the realization and attribution of desired programmatic impacts.

Introduction

Market transformational portfolios have been evolving within the energy efficiency industry since the 1970s. (Kunkle, 1998) Kunkle and Lutzenhiser concluded the following in their 1998 paper:

> *It is necessary to develop approaches that help us better understand the motives and behaviors of markets actors ... To do so, we need new multidisciplinary understandings of markets and the market transformation problem, and we need to apply the methods of the social sciences. This will provide the underlying theory necessary for effective market transformation program development and supply a framework for quality assurance and continuous improvement. (Kunkle, 1998)*

Today, one could draw similar conclusions; however, we are beginning to see the integration of multidisciplinary understandings from other industries. Market transformation initiatives seek to influence energy behaviors, where technology alone cannot resolve societal demand for carbon reduction, electricity reliability, and energy independence.

With behavioral change strategies receiving attention, research has attempted to quantify the technical potential of 'soft measures'. These soft measures are best understood as interactions between humans and energy end-uses. More specifically, soft measures are sponsored interventions that intend to alter human interaction with energy end-use applications. Examples of these behavioral approaches include informational brochures that encourage deeper thermostat set backs;

building manager training to improve system efficiency; and real-time feedback gained from ZigBee-enabled in-home displays is all soft measures.

When utilities offer rebates for the purchase of Energy Star-labeled products, the resulting performance metric tends to be simple counts of the redeemed coupons. If we instead think of behaviors as transactions, then we open a new construct upon which behavioral change can be explored.

Analytics used in the retail sector have metrics that explore individual transactions. Metrics for a typical transaction include the number of members in a party, the quantity of products purchased, the average size of a transaction, and the duration of a retail transaction. Even these few retail metrics suggest that more could be understood of human interactions with energy end uses. Do we know how many members are in the household, how many energy applications exist in the home, what are the savings potential of each energy transaction, and how long the effect tends to last within the household?

If retail analytics provide valuable metrics, then other industries must also add value in the design of market transformational interventions. From the Trans-Theortetical Model (TTM) of behavioral self-change, we understand that change is a process that unfolds over time; not a singular event. Participation in the process of change is what enhances society and prepares market actors to support energy efficiency in the future.

Even when individuals come unprepared to adopt recommended energy behaviors, the TTM provides program managers with objectives around which energy efficiency programs can be designed.

The Transtheoretical Model

Drs. Prochaska, Norcross, and DiClemente studied how individuals progress through self-initiated behavioral change. Their work was captured in the book, "Changing for Good: A Revolutionary Six-Stage Program for Overcoming Bad Habits and Moving Your Life Positively Forward." (Prochaska, 1994)

Despite being written for the general public, the book is largely an academic read that presented ten strategies applicable across six stages of change. The six stages of change are precontemplation, contemplation, preparation, action, maintenance, and termination. Over time, the final stage was replaced with a perpetual period of maintenance and the ever-present possibility of relapse. Furthermore, relapse is now considered a natural part of the change process.

Despite the successful integration of the TTM within smoking cessation, AIDs prevention, domestic violence, anti-bullying initiatives, and substance abuse programs, our experience within the energy industry has been somewhat frustrating. KMDR Research had little success integrating a staged approach within energy efficiency portfolios until we introduced the stages as personas; personas that can be thought of as market segments. Once the idea of personas was explored, the stages of change were easier to integrate into energy efficiency programs.

One example is the Everyday Actions Save Energy (EASE) Program managed by Cathy Merritt of CLEAResult Great Lakes. This staged-based program helps low-income families identify and adopt energy savings opportunities via a *Home Energy Profile* built upon the disaggregation of home energy use. Educators alter their messaging and expectations based on the persona assigned to their clients. Families whose attention are dominated by unfortunate circumstance are simply encouraged to revisit energy use when key milestones are met. Other families who are prioritizing monthly expenditures are encouraged to adopt conservation measures as a means to lower financial insecurity. The use of personas within the EASE program ensures that every household has an outcome against which program performance can be assessed.

Personas as the Stages of Change

Five personas are presented in Figure 1 and defined in the text that follows. Each of the five personas represent one-half stage of change in Prochaska's Transtheoretical Model and the sixth stage appearing as a transitional regression from one stage to an other.

Figure 1: The Personas representing Prochaska's Stages of Change
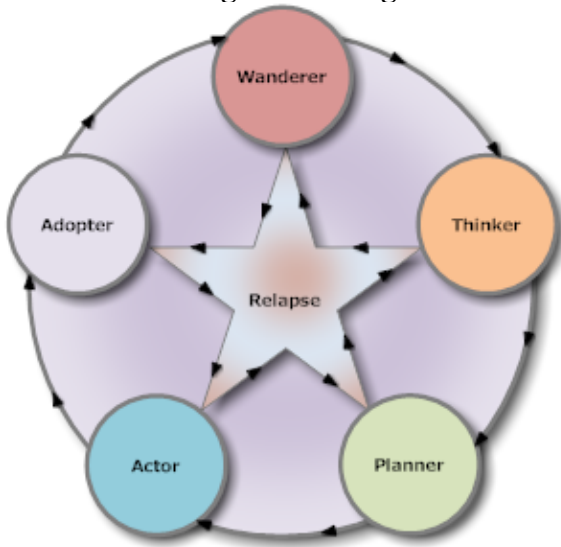
Wanderers (precontemplation) move about without a definite destination or purpose. These individuals do not appreciate the consequences of their behaviors and are generally satisfied with their choices. Alternatively, they may tried, failed, and become demoralized by early efforts to change behaviors. For this reason, these individuals have yet to contemplate the need to alter behaviors under present circumstance.

Thinkers (contemplation) devote much time to thought. These individuals are aware that current behaviors have had unwanted consequences and that new behaviors could offer desired benefits. Still, the cost of change remains a hurdle to any real commitment. Therefore, new behaviors require additional consideration of the associated pros and cons.

Planners (preparation) work out methods to accomplish an objective in advance of action. These individuals have considered the pros and cons of behavioral change and have decided to move towards a new set of behaviors. In preparation for the difficult process of change, these individuals seek information, tools, and support in the development of an action plan.

Actors (action) are participating in the process of change. These individuals have tried new behaviors and are tracking the results. The new behaviors feel unnatural, but remain worthy of pursuit. Actors consciously repeat the desired behaviors within the context of an action plan.

Adopters (maintenance) have assumed a new standard of practice. These individuals have repeated the new behaviors and became comfortable with them. The new behaviors appear more natural and require little conscious effort to maintain.

Relapse is the process of falling back to a prior stage of change or regressing into another persona. This process is now considered normal and should be expected of all individuals seeking to adopt new behaviors.

Self-Change Strategies

Another element of the TTM is the recognition of ten behavioral self-change strategies. (Patten, 2000; Prochaska, 1992; Prochaska, 1997; Velicer, 1998). We have adapted the ten behavioral self-change strategies; attempting to make them more accessible to those with no prior study of behavioral modification strategies. The adaptations are identified and described in Figure 2 as a set of strategies that are supported by a range of tactics as applied in-field.
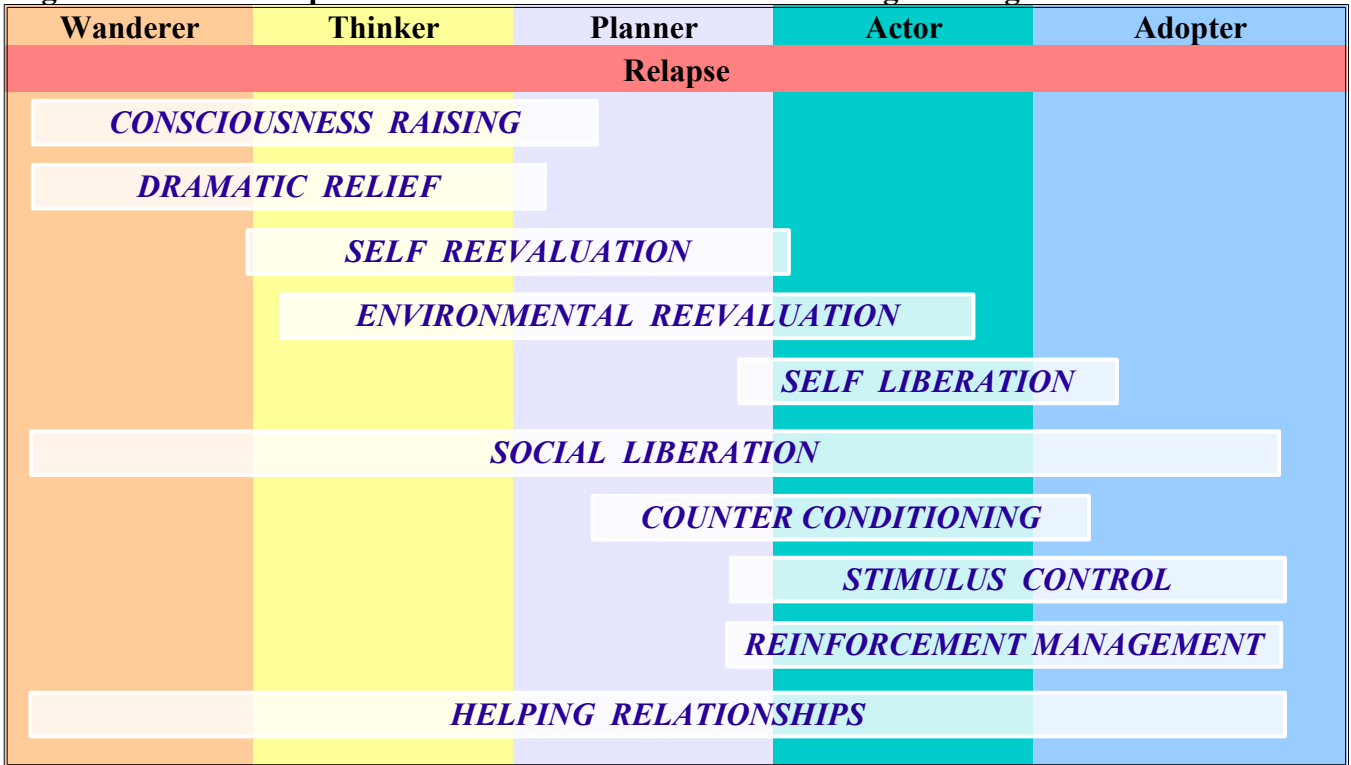
Figure 2: Behavioral Self-Change Strategies

STRATEGY	DESCRIPTION AND TACTICS
Consciousness Raising	A strategy that challenges existing attitudes regarding current behaviors. Awareness of the consequences, causes, and cures of a target behavior are raised. Promotional campaigns, informational tools, educational initiatives, confrontation, interpretation, etc. are applicable tactics for consciousness-raising.
Dramatic Relief	A strategy that allows individuals to experience feelings and express emotions associated with current behavioral patterns. Life events, role-playing, testimonials, facilitation, and promotional campaigns are available tactics to advance an individual through the early stages of behavioral charge.
Self Reevaluation	A strategy that explores an individual's self image with existing behaviors against an individuals self image with new behaviors in place. Individuals are encouraged to reassess the way they feel and think about their existing and desired behaviors. Value clarification, role play, and visioning are tactics used to trigger self reevaluation.
Environmental Reevaluation	A strategy that explores how one's social environment changes as a result of new behaviors. Individuals are made aware of their impact on others around them. Empathy training, documentaries, and interventions are tactics that help inform individuals of how others perceive their behaviors.
Self Liberation	A strategy that raises an individual's confidence in their own ability to adopt a set of desired behaviors. Tactics like personal resolutions, public testimonies, assertiveness training, and self-motivation liberate individuals to envision a new self; whereby, a set of desired behaviors are embraced.
Social Liberation	A strategy that increases opportunities for desired behaviors in society. Tactics include advocacy, technical assistance, white papers, legislative action, regulation, infrastructure investment, and other policy intervention assist society in adopting and maintaining a set of desired behaviors.
Counter Conditioning	A strategy that encourages alternate behaviors when external stimuli trigger targeted behaviors. Tactics applicable within this strategy include cognitive recondition. Techniques like relaxation, desensitization, assertion, internal dialog, and contingency planning support desired behavioral change, raise self-efficacy, and deter regression to targeted behaviors.
Stimulus Control	A strategy that restructures an individual's environment to remove external stimuli associated with the targeted behaviors and replace them with stimuli that prompt individuals to adopt desired behaviors. Tactics to limit counter-productive stimuli include restructuring one's own home and work environments, socializing with individuals targeting similar behaviors, and avoiding challenging situations support behavioral self-change and lower the propensity for relapse.
Reinforcement Management	A strategy that involves increasing the intrinsic and extrinsic rewards for potential behavioral change and decreasing the rewards for unhealthy behaviors. These strategies are found within counseling services. Contingency contracts, overt and covert reinforcement, self-reward, and group recognition are employable tactics to support the adoption of desired behaviors.
Helping Relationships	A strategy that relies on trusted sources to participate in the success of individuals seeking behavioral change. These helping relationships can found within self-help groups, therapeutic alliances, buddy systems, counselor calls, software tools, and social support networks. They may also involve an individual's family, friends, co-workers, and partners. Helping relationships provide long-term support of an individual's desire to adopt and maintain new behaviors; while also bolstering other strategies throughout the process of behavioral self-change.

Application of the Transtheoretical Model

Impressed by the value of this model of change, KMDR Research offered introductory training to energy educators for the period 2003 to 2008 on the efficacy of the Transtheoretical Model for the energy industry. In Figure 3, we offer a graphic that illustrates the stages of change (horizontal axis) in relation to the recommended application of the ten self-change strategies (vertical axis). (adapted from Velicer 1998; Prochaska 1994)

Figure 3: Relationship between the Personas and the Self-Change Strategies

Wanderer	Thinker	Planner	Actor	Adopter
		Relapse		
CONSCIOUSNESS RAISING				
DRAMATIC RELIEF				
SELF REEVALUATION				
ENVIRONMENTAL REEVALUATION				
			SELF LIBERATION	
SOCIAL LIBERATION				
		COUNTER CONDITIONING		
			STIMULUS CONTROL	
		REINFORCEMENT MANAGEMENT		
	HELPING RELATIONSHIPS			

The TTM is a hybrid model of behavioral change; making use of many strategies to encourage individuals through the stages of change. For market-based programs, program managers may apply the TTM by looking at personas as market segments and ensure that all individuals have elements of the program that address their needs.

Wanderers are the first and arguably largest market segment. For any target behavior, it is believed that 40% of individuals do not consider their existing behaviors as problematic. (Prochaska, 1994) For this reason, external support is necessary for these individuals to consider changing their energy behaviors. These individuals require consciousness raising to appreciate their contribution to electricity demand and environmental ramifications of individual energy behaviors. Social liberation may raise the overall cost of energy by taxing energy consumption or charge time-of-use rates with critical peak pricing.

Particularly effective at engaging consumers has been a facilitated public forum. In Ontario, we led several discussions of green energy policy with the general public. We provided industry expertise for conscious raising, experienced facilitators to raise emotions in dramatic relief, copies of legislative talking points to socially liberate the exploration of the Green Economy, and an offer of continued support in the form of continued advocacy to balance environmental and economic factors of energy policy.

Dramatic relief allowed individuals to explore unpopular ideas regarding energy use and the helping relationships challenged their assertions and provide source material. By so doing, individuals who stopped by the event without preconditions regarding energy policy were able to begin thinking about whether or not they should adopt behaviors in support of local energy policy.

Most energy efficiency programs seek to fill informational gaps to encourage rational actors to adopt energy efficiency behaviors. While this helps move those interested in energy policy to consider altering their behaviors, informational initiatives may fall short in driving action. This is to be expected under the TTM. Thinkers make use of information to facilitate self-reevaluation and to reassess their impact on others. A successful outcome would be to have thinkers become planners in the exploration of desired energy behaviors.

Planners can be further actuated by also providing countering strategies. Countering strategies may be something as simple as providing counter arguments for other household members who seek to raise the temperature set point or by providing flashcards to prepare individuals to counter common beliefs in relation to desired energy behaviors.

Conservation Connection Consulting based out of Wisconsin has one such set of cards. This deck of cards illustrates energy savings opportunities, lists the rationale behind the energy savings opportunities, and offers discussion points to open a dialog around desirable energy behaviors. As such, these cards employ at least six key self-change strategies in a single implementation tool; namely, conscious raising, dramatic relief, social liberation, self liberation, helping relationships, counter conditioning, and self-reevaluation.

Our experience in market transformational program design suggests that Figure 3 has been one of the most useful tools for the application of the TTM. Figure 3 makes clear that self -change strategies work simultaneously across the various personas. In our consulting work, we have seen various utilities and agencies struggle with its application. For this reason, we developed a new construct under which the TTM can be applied covertly. Implementers need not have prior experience with behavioral change theory to apply the cognitive-structural-behavioral construct offered in the text that follows.

The Cognitive-Structural-Behavioral (CSB) Construct

We often introduce the CSB Construct to laymen in the following manner: when attitudes and abilities to act upon those attitudes coexist, a set of desired behaviors predictably results. While this is an oversimplification of the CSB Construct, the direct prediction of behavioral change remains a useful strategy to apply and test the CSB Construct illustrated in Figure 4.

Figure 4: The Cognitive-Structural-Behavioral Construct
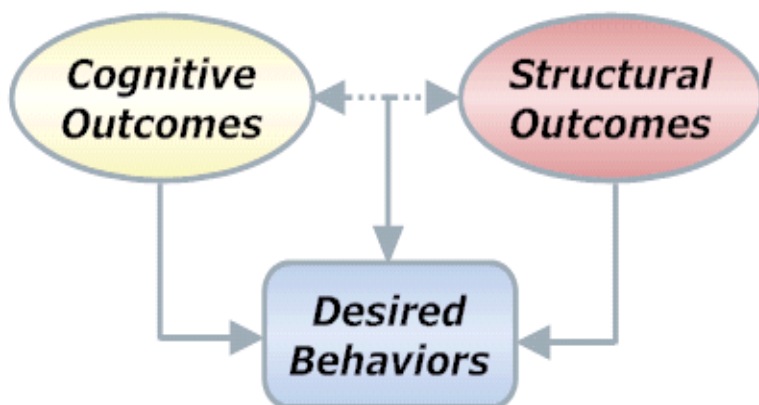
Evolution of the CSB Construct

Our work, over the past decade, has been focused on the design of market transformational programs and their evaluation. This concentration of activity around market transformational theory led us away from complex behavioral change theories to simpler models. The rationale for this evolution was the need to attribute program impacts to market-based behavioral outcomes.

KMDR Research often began by cataloging behavioral outcomes observed in the market place. We used a behavioral dashboard to capture market transactions and commissioned other studies to verify the behaviors at both an individual and market level. (Monte de Ramos, 2010) We would then assign energy savings, emission reductions, or load shape improvements directly from the observed behaviors. While we were confident the behaviors themselves were manifested in the market, we used only congruency with program theory to attribute savings.

This shortcoming always disturbed us, but resource constraints and methodological limitations seemed to justify the shortcut. However, we would find that program theory often centered around two overarching strategies; changes in attitudes regarding energy use or changes in abilities to better manage energy use.

Elements of the CSB Construct

The theory evolved into one comprised of three components: cognitive outcomes, structural outcomes, and behavioral outcomes. These are defined in the following paragraphs.

> **Cognitive outcomes** are characterized by changes in the mental processes realized by individual market actors and reflected in organizations affected by programmatic outputs. These changes are typified by changes in awareness, knowledge, and attitudes, but also include changes in traits and characteristics altered via acquired learning, skills development, insight, understanding, perspective, outlook, ambition, desire, etc.

> **Structural outcomes** are the physical changes observed in the marketplace that have resulted from programmatic outputs. These structural outcomes are typified by changes in the overall capability of the market; often in the form of enhanced tools, technical references, standards of practice, regulatory requirements, technology innovation, market structure, financing instruments, product pricing, quantity of skilled tradesmen, and other market changes the alter the cumulative abilities of relevant market actors.

> **Behavioral outcomes** are the changes in market activities resulting from the structural or cognitive outcomes. These actor behaviors are typified by product shipments, retail transactions, stocking practices, technology utilization, energy use, load shifting, etc. These outcomes are manifested by market actors influenced by the program.

Emerging from our application of the TTM was a theoretical construct relating behavioral change to just three composite elements. We refer to this approach as the CSB Construct; whereby, the C, S, and B refer to the three elements of the the theoretical construct: cognitive, structural, and behavioral outcomes.

The CSB Construct resonated with our clients. The CSB was easily understood by program administrators and robust enough to support theory-based evaluation. For example, we were charged with evaluation planning for a program of national scope; namely, building codes, standards, and benchmarking.

The cognitive outcomes specified for the portfolios were as follows: greater knowledge of energy savings opportunities and building energy use, applicability of learned behaviors, and growing preference for energy efficient products.

The structural outcomes sought for the portfolio were as follows: product availability, increased number of energy engineers, code compliance tools, guidelines for building performance, energy transaction scenario analysis tools, benchmarking software, and the adoption or compliance with model building codes.

The behavioral outcomes were specified as follows: use of the structural outcomes to better manage building energy use, sponsored interaction between energy professionals on a regular basis, and greater propensity for the adoption of energy efficient practices.

Following the CSB Construct, evaluators may hypothesize and test that a change in a building manager's knowledge of energy savings opportunity, coupled with the publication and training on building performance guidelines, leads building managers to better manage building energy use and to discuss energy use with his/her colleagues from similar properties. Similarly, one may hypothesize and test the propensity for building managers who have benchmarked their properties to act upon a greater number of energy saving opportunities.

The point of the CSB Construct is to provide researchers with flexibility to conduct outcome evaluations and behavioral experiments to attribute program impacts to the observed cognitive, structural, and behavioral outcomes. Still, it is necessary to develop a causal linkage from program resource expenditures to observed outcomes and anticipated programmatic impacts. To accomplish this, the CSB Construct was expanded to include resource expenditures, unanticipated impacts, market influences, and programmatic outputs.

The result was a logic modeling template, shown in Figure 5, that is now embedded in Ontario's *Evaluation, Measurement, and Verification (EM&V) Protocols and Requirements.* The modeling of program theory follows from program expenditures to programmatic outputs; from program outputs to cognitive and structural outcomes; from cognitive and structural outcomes to behavioral outcomes, and from behavioral outcomes to program impacts, both intended and unintended.

Figure 5: Program Logic Model Template[1]
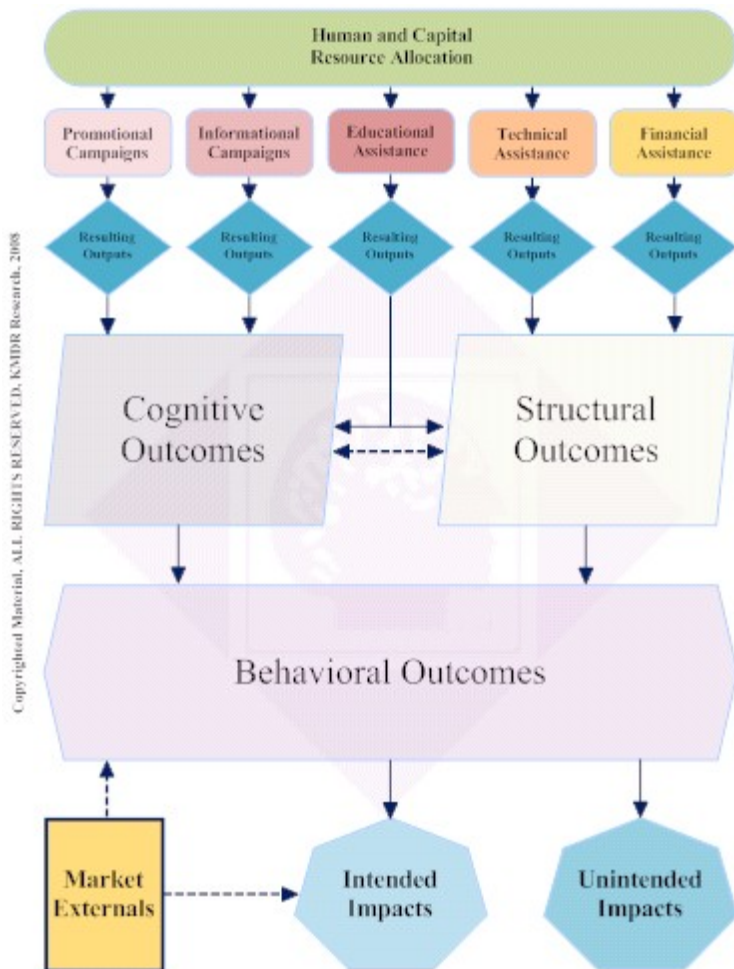
The logic model defines five programmatic activities commonly used within energy efficiency programs: promotional campaigns, informational campaigns, educational services, technical assistance, and financial assistance. The observant reader will note that promotional and informational campaigns are similar to tactics used to raise consciousness under the TTM. Also, educational and technical assistance alter both the individual and the marketplace in support of energy efficiency. These program activities are closely linked to self-change strategies associated with thinkers and planners. As one last example, guidelines and software tools can serve as a form of helping relationship; making energy use more accessible to the building operator.

All programmatic activities can relate back to either the CSB Construct or the TTM. As such, one need not choose between one approach over the other. The activities defined in Figure 5, produce outputs that link program performance metrics (outputs) and to cognitive, structural, and behavioral outcomes. The quantification of these linkages forms the basis for causal attribution.

For those readers seeking additional information on the logic model template, we suggest they read the paper, *Ontario's Evaluation, Measurement, and Verification Protocols and Requirements*. This paper is being presented at the same conference and can be found in the proceedings published by the IEPEC.

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1 Used with permission from KMDR Research; an illustration taken from *"Modeling the Logic of Market Transformational Programs* (2008), an evaluation planning training course for program design staff.

Application of the CSB Construct

The CSB Construct provides a model for market transformational program design. When embedded within a logic model template, a management tool results to design, implement, and evaluate the effectiveness of soft measures within energy efficiency program designs.

The CSB suggests that either structural or cognitive outcomes drive behaviors. Structural outcomes are exemplified by technology introduction, rate design, regulation, tools, and financing instruments. Prepayment meters involve all of the structural outcomes mentioned. Even without additional guidance provided the utility customer, a 12% to 15% conservation effect has been realized from the implementation of a prepayment solution at several utilities across North America. (Loeff, 2011)

One manifestation of the conservation effect was told to us by a an executive of Woodstock Hydro, a local electric distribution company in Ontario. He spoke of a young girl who returned home from school to have lunch. A short walk through the snow left here cold and uncomfortable in the empty home. She would toss her wool mittens, her scarf, and her knit toque into the dryer for a half hour. After a quick meal, she would retrieve her warmed wools; returning to school. This would repeat three times per week on average. With instantaneous feedback provided by the in-home display, she noticed that electricity demand jumped 6 kW. Even without technical help to interpret the kW readings, she applied the substantive lesson that heating her gloves was not a wise use of electricity. This was a simple example of how feedback, a structural outcome, effected a self-realized cognitive outcome that led her to a desired behavioral outcome, energy conservation.

The last example is one related to codes and standards. Even as the 2011 National Energy Code for Buildings is currently being introduced in Canada, market actors are beginning to apply standards associated with the 2015 National Energy Code for Buildings. The codes and standards committee was organized by National Research Council of Canada and funded in large part by Natural Resources Canada. Therefore, the committees themselves should be viewed as a structural outcome within the CSB Construct. As such, a pathway was developed to attribute program effect to the early adoption of codes and standards. Absent the CSB Construct, these effects would remain an unattributed evolution of the market; thereby, leaving the energy savings unclaimed.

The value of the CSB Construct is that an attribution pathway can be established for observed market transformations. Still, the application of the CSB Construct relies on the expertise of program implementation staff and evaluators who have worked in the field. Only practical experience with the planned interventions allows practitioners of the CSB Construct to properly attribute all market effects in a market full of confounding variables.

Conclusion

Encouraged by the early successes of Drs. Prohaska, DiClemente, and Norcross with the Transtheoretical Model of behavioral self-change, KMDR Research introduced TTM training for the utility services industry in 2003. The behavioral science nomenclature embedded within the TTM resulted in early resistance to its adoption. We decided to simplify the model by replacing stages with personas. This provided client managers with a familiar analogy: one of market segmentation.

Further developments evolved the TTM into the CSB Construct. By focusing client efforts around cognitive and structural outcomes, market transformational theory became accessible. Via the CSB Construct, our clients were able to articulate an attribution pathway for anticipated behavioral changes in a complex and often confounding market.

The CSB Construct was embedded in logic model training courses; thereby, making it accessible to utilities and agencies. As a consequence, there exist a number of notable applications of this construct to program design and evaluation. The most visible adaptation is within *Ontario's*

EM&V Protocols and Requirements. A logic model template featuring the CSB Construct is suggested in the assessment of Ontario's $1.4 billion Conservation and Demand Management portfolio of programs.

While we are finding successes in the use of the CSB Construct and continued applications for the change strategies associated with the TTM, additional research is needed to demonstrate the technical potential of behavioral change to energy efficiency initiatives, conservation behaviors, and demand response programs. In particular, we would like to gauge whether the CSB Construct offers a useful framework for assessing the progress of twenty-eight member nations towards energy efficiency targets sought by the European Commission on Energy.

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