Building a Broadband Community with a Baldrige Based Approach

Dr. Michael Browder, Bristol Tennessee Essential Services

Michael Browder, a past chairman of American Public Power Association's Board, has served as CEO of Bristol Tennessee Essential Services (BTES) since 1977. He earned his doctorate of Educational Leadership and Policy Analysis from ETSU, his Master of Administrative Science from the University of Alabama Huntsville and a Bachelor of Electrical Engineering from Auburn University. He is a registered Professional Engineer. Dr. Browder is the 2010 recipient of the Tennessee Center for Performance Excellences' Ned Ray McWherter Leadership Award. Under his leadership, BTES has been awarded the prestigious TNCPE Level 4 Excellence Award both in 1993 and 2012.

Dr. Andrew J. Czuchry, East Tennessee State University

Andrew Czuchry received his Ph.D. from the University of Connecticut in 1969 with a concentration in guidance and control systems engineering. He has more than twenty years experience as a professional manager in technical innovation and the electronics manufacturing industry. Dr. Czuchry has been the holder of the AFG Industries Chair of Excellence in Business and Technology since joining East Tennessee State University in 1992. He has published extensively in refereed journals and proceedings of professional organizations related to his field.

April Eads

April Eads is the Business Development Manager for Bristol Tennessee Essential Services (BTES). She has been with BTES since 1996.

April has her Associate of Applied Science in Electrical Technology from Northeast State Community College, her Bachelor of Applied Science and Master of Science from East Tennessee State University.

She began her career at BTES in the Customer Service Department, later moving to the Engineering Department. After working as an Engineering Assistant for several years, she was promoted to Business Development Manager, where she assists local industry by facilitating resources that assist in bringing new jobs and capital investment to her community.

April graduated from Oklahoma University's Economic Development Institute and she is a Certified Economic Developer.

April is married to Tim Eads and has two sons, Tyler 19 and Kodee 14. April is active in the community and serves on Bristol Morning Rotary Board; Chamber of Commerce Lead Bristol Advisory Committee; and the Northeast Tennessee Regional Industrial Association Advisory Committee.

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Abstract

This article makes a contribution by providing a conceptual framework for transforming the innovative use of information technology into business growth by simultaneously solving the combined technology and business problem. A total systems approach is facilitated by deploying the National Baldrige Criteria for Performance Excellence for evaluating business model improvements while embedding the disruptive use of information technology. See Clayton M. Christensen's pioneering work[1]. A key finding of this applied research is that by concurrently solving the business and technology innovations far greater financial success can be realized than when the **engineering and engineering management** functions are treated independently or in series. Leadership and technical leaders from all areas look for innovative technology that can enhance both business units. The business problem was solved using a non linear approach without disrupting the company's day to day operation. The result became two stand alone non linear businesses operating under a joint linear process.

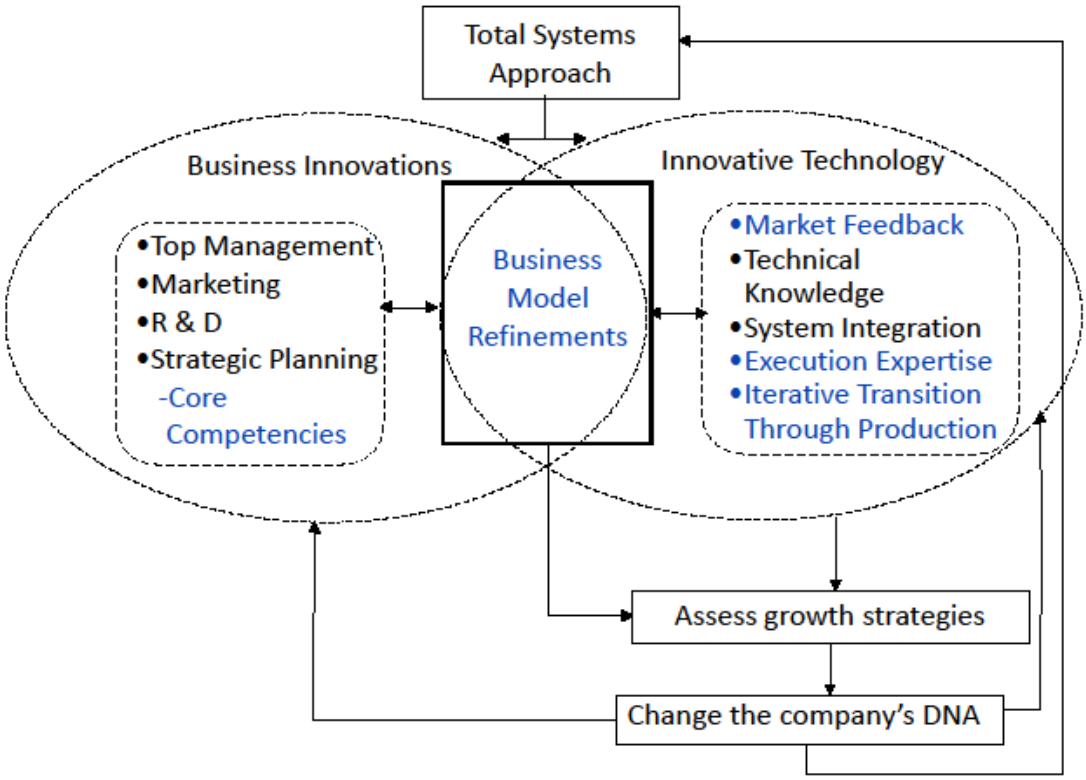
Introduction

The conceptual framework, facilitated by applying Baldrige Criteria, is illustrated and implementation coaching points are suggested using the technology and business narrative of the transformation of Bristol Tennessee Electric System into Bristol Tennessee Essential Services (BTES). The eureka occurred when the engineering plan to implement a broadband service capability was viewed as also providing enhanced capabilities for the core electrical power distribution business itself. The engineering focused business growth plan called for an initial investment of over 20 million dollars growing to more than $65 million over the ten year deployment cycle. Although financially sound, the engineering entrepreneurial view would not have met the thresholds expected from technology based startups in the information technology arena. However, when viewed as a simultaneous engineering and engineering management challenge, it was recognized that the broadband capability also provided improved reliability of the electrical power distribution system. In the Baldrige context this fact was in strategic alignment with a key organizational objective of providing reliable electrical power. The impact on core business key success factors was assessed with the aid of an Electric Power Research Institute (EPRI) Report (1996)[2] suggesting that the cost of power outages were expensive to consumers. These financial impacts have been updated in 2006 and indicate that on a national level the "annual cost for power interruptions to U.S. electricity consumers is $79 billion". Please see LBNL-58164 "Cost of Power Interruptions to Electricity Consumers in the United States (U.S.)" (2006).[3]

Being sensitive underscored the value to the core business and resulted in unanimous board approval. As a result, the combined engineering and engineering management solution to a concurrent engineering and engineering management problem achieved remarkable results. For example, the joint approach resulted in financial breakeven nine years ahead of the entrepreneurial engineering startup approach. Bristol has become a Broadband Community with

each customer having access to 1 gigabit per second of bandwidth capability; and the Baldrige Based Approach has expedited efforts to provide a highly reliable, effective and efficient smart grid power system. The lessons learned from BTES's continuing journey are translated into coaching points in this article. To the extent others choosing to implement the conceptual framework offered in this article find these coaching points helpful, a significant contribution will have been made. The conceptual framework for implementation is given in Figure 1 below.

Figure 1: A Conceptual Framework for Implementation



This study has three primary aims. The first objective is to provide an overarching performance excellence framework for the conceptual framework given in Figure 1. We begin with the classic Baldrige systems diagram with the seven categories: Leadership; Strategic Planning; Customer and Market Focus; Measurement, Analysis, and Knowledge Management; Human Resource Focus; Process Management; and Business and Organizational Performance Results. Our experience with the Tennessee Performance Excellence (TNCPE) Process for the past 20 years suggests that outstanding organizations fully engaged in this process continue to grow and excel. Notice that Category 7 appears to imply a combination of both technology innovation and business results. In practice however; most organizations treat their Research and Development efforts coupled with marketing considerations, but essentially independent from the business growth model for their core business units. This practical observation resulting from reviewing more than 1000 Tennessee organizations over the past 20 years, underscores the gap identified in the relevant literature section of this article.

It is also noteworthy that the 2014 Baldrige criteria place an increased emphasis on the need for innovation to enhance survival likelihood in today's global competitive arena. By definition these innovations are non-linear in nature. Hence the classic ANOVA approach taken by much of the business management research may find difficulty in analyzing the consequences of innovative technologies or disruptive innovations introduced by Harvard professor Christensen (1996).[1] A second aim of this current article is to recommend a non-linear thought process to refine the organization's business model based upon their marketing of innovative technology.

The third and final aim of the applied research presented in this article is to systematically apply a combined marketing and technology development/deployment approach that is by its nature drastically different from Porter's (2008) five forces and companion marketing approaches taught in many MBA programs.[4]

Relevant Literature

Although not specifically called out as a total systems approach, the work of Kuruppuarachchi and Perera (2012) on the Co-Alignment Between Technology Management and Total Quality Management Practices provides a useful stepping stone to the Baldrige frame given in Figure 2.[5] The need for value creation within the marketing function is further underscored by Gronroos (2010)[6] and Gronroos and Ravald (2011).[7] When combined with the efforts of Talib et al., (2011)[8] and (2013)[9] the need for a systems approach for adding value throughout the supply chain is further illuminated. However, an apparent gap exists when innovation is needed because practical experience indicates that many organizations treat Research and Development (R & D) as marketing focused but not fully integrated with expanded core competences that augment their core business unit's marketing functions. Perhaps part of the gap is addressed by timing of value added innovations when dealing with second through fourth tier members of the supply change. One argument for this short fall may be the target clients for value added innovations by lower tiered members of this supply chain. For example, many SMEs focus on their customer's purchasing agent whose reward system results in a price only competition, Czuchry and Yasin (1999)[10]. The Volkswagen Supplier Park concept makes a significant stride in engaging their suppliers through just in time and innovation partnerships. Perhaps the Baldrige approach suggested in this current article could further enhance the SMEs marketing of innovative technology when the conceptual framework given in Figure 1 is fully deployed. To the extent that this article achieves its first aim, a contribution will have been made.

Turning to the second aim of this article, we see that the relevant literature seeks to close a gap in the missing non-linear thought process necessary for the engineering manager to refine the organization's business model to capitalize on their marketing of innovative technology. Specifically the impacts of disruptive innovations introduced by Harvard professor Christensen (1996)[1] on the automotive and information technology industries have been dramatic. However, such approaches are often driven from the top-down and often have political overtones that are beyond the grasp of the SME. Consider Toyota, Honda, and now Kia as examples. The literature may have made the case that innovation is pulled through the automotive supply chain rather than being pushed. The authors' experience suggests that as a consequence many performance, reliability, and cost innovations are lying dormant in the lower tiered suppliers. To what extent the conceptual framework is applicable in the automotive supply chain is an area for

future research. However, the BTES journey in building a broadband 1 gigibit community could provide valuable coaching points for SMEs attempting to introduce information technology disruptions in their industry. Perhaps this article makes a second contribution to the electrical power distribution industry with the non-linear thinking approach that is embedded in the conceptual framework offered in Figure 1.

Figure 2: The Baldrige Systems Model

From: TNCPE.ORG

The literature is sparse in dealing with the challenge of deploying combined non-linear solutions to the non-linear problem of organizational sustainability, Stead & Stead (2014)[11]. However, the seminal work of Timmons and Spinelli (2008)[12] in developing a process for commercializing technology in start-up ventures can be tailored to close this apparent gap in the literature as shown in Exhibit 1. When combined with the conceptual framework of Figure 1 a key result of this article is that by concurrently solving the business and technology innovations far greater financial success can be realized than when the **engineering and engineering management** functions are treated independently or in series.

Exhibit 1: The Entrepreneurial Process

Phase 1: A Viable Idea
- Step 1: Idea generation
  - Intellectual property
  - The entrepreneurial thought process
- Step 2: Initial screening: Note Criteria
  - The real opportunity test
  - Test for strategic leverage
  - Test personal and business criteria, and business concept questions
- Step 3: Initial feedback from panel
  - Review your ideas with successful business people

Phase 2: Planning for a New Venture
- Step 4**: Focus on the customer oriented marketing planning**
- Step 5: Strategic thinking and planning
- Step 6: Generating a solid financial plan
- Step 7: Structuring the deal
- Step 8: Building the entrepreneurial organization
- Step 9: Crafting the business plan
- Step 10: Receiving detailed feedback and transition to implementation

Study Setting

In order to meet the three major aims of this study we begin with the Baldrige criteria framework shown in Figure 2. The TNCPE Process uses this identical framework that is currently updated every two years. Although our experience suggests that the framework given in Figure 1 will be helpful to both large and, small to medium sized (SMEs) organizations; this article focuses on small organization for two reasons. First, small businesses represent more than 99.7 percent of all businesses and employ 57.4 million people (Small Business Administration, September 28, 2006).[13] So with regard to our engineering and engineering management programs, we anticipate an increasing number of current and future students from the SME sector. Secondly, Bristol Tennessee Essential Services (BTES) is one of three organizations to have won the highest level of recognition in the TNCPE Program multiple times. They are, however, the only organization to have received the highest award level recognition both before and after experiencing a dramatic change in their DNA.

Bristol Tennessee Essential Services is a municipally-owned electric utility that also provides an advanced fiber optic network that supports its electric system. Driven by a need for improved communications BTES began exploring fiber optics as a means for achieving these improvements. On December 15, 2004, the BTES Board of Directors changed the name of the organization from Bristol Tennessee Electric System to Bristol Tennessee Essential Services to capitalize on their brand recognition in the community as a low cost-high quality provider of electricity to the community they serve. Hopefully, lessons learned on the BTES journey could become valuable coaching points to others confronted with similar challenges and opportunities.

Coaching Points for Deploying the Conceptual Framework

The overarching coaching point is to treat technology and business innovations simultaneously. By solving the combined engineering and business problem, non-linear effects are analyzed as a system rather than decoupled linear events. The total systems approach offered in this article provides a dynamic closed loop process involving a sequence of creation, practical implementation and value added change. Detailed analyses are conducted for attractive technologies that meet the real opportunity test; i.e., the innovations create value that customers are willing to pay a premium to receive. The general entrepreneurial thinking guideline is that innovations that create such value outperform those that result in “me too” or cost only competition. However, this approach can be tailored to the specific industry as is the case for BTES who has never charged a premium for their broadband services; except when additional capabilities are provided at a competitive price. Consistent with their mission and vision, they have provided better, more reliable service at the same or lower cost to the customer. Then they capitalized on the synergy of combining engineering operations and business equipment and using these synergies to have a better outcome at a lower cost. Infrastructure is expensive, leadership and technical leaders from both business units look at the usefulness of the technology and the enhancement of the combined unit. The end result becomes operating the single unit more efficiently.

Hence the coaching points to be underscored are to analyze the non-linear events as a total system, treat the technology and business innovations simultaneously, and then assess and

evaluate alternatives in the context of the organizations current mission and vision. The iterative nature of the process is important because when the organization's fundamental DNA needs to be modified the combined mission and vision may also be altered in the context of the new and/or improved core competences that have resulted. Although conceptually straightforward, the non-linear impacts of complete restructuring of organization's mission and vision are a daunting proposition at best. Most CEOs would not undertake such a dramatic approach. Fortunately there is a more conservative approach that consists of conducting incremental pilot projects to evaluate the consequences of the non-linear changes that occur. Since large organizations are typically even less agile, they often select merger, acquisition and strategic joint ventures and their less risky strategic orientation from the CEO's vantage point. These strategic alternatives are currently under investigation as ways that the conceptual framework can be tailored and modified to help large organizations achieve their innovation objectives.

Pilot projects are conducted in our living laboratory to verify the non-linear results. Then refinements are incorporated to the detailed business plan that is systematically implemented in concert with the Check-Act-Plan – Do improvement process that has been successful for the core business. This is significant because changing processes in this manner avoids destruction of those approaches that are already contributing to the organization's success.

The need for a total systems approach is underscored for two reasons: First a higher order system is necessary to ensure consistency in this highly non-linear environment. See Kurt Gödel completeness theorem from his dissertation (Gödel 1929) that has been nicely summarized in *The Stanford Encyclopedia of Philosophy (2007*).[14] Furthermore a pitfall of linear system thinking (superposition) often leads to a local optimum that can be destabilizing in the total non-linear system. This particular consequence is illustrated for the bang-bang control of 1000 hot water heaters versus the individual control of this same population; and the dramatic difference in consequences on power grid demands.

Given the Baldrige total systems framework, candidate innovative technologies can be evaluated simultaneously guided by the framework. In this context it becomes essential to use pilot projects to adequately assess the non-linear effects of both the new market growth strategies and the additional core competencies that result from the innovative technologies. We have found that introduction of a Baldrige category 2 strategic planning process in the new venture assessment process, as well as considering an expanded form of partnerships much earlier than has been traditionally done in the business entrepreneurship curriculum as significant improvements.

One method of deployment is to treat business opportunities as quantifiable changes in operations that provide measurable results. Such an approach is important because in order to be controlled these items must be both measureable and observable. This is often easier said than done. As an illustration, consider the Baldrige definition of organizational sustainability 2011 - 2012.[15] "[…] the contributions you make with the well being of environmental, social, and economic systems are part of your organization societal responsibilities […] may also affect [your organization's] sustainability. Entrepreneurial finance provides proven techniques for economic results in terms of actual sales and pro forma analyses. While environmental consequences have become more quantifiable because of efforts such as the LEED green

building certification.[16] However metrics for the social dimension of organizational sustainability remain elusive.

Nevertheless, the guidance provided by the framework in Figure 1 becomes invaluable when evaluating combined information technology (IT) and business innovations when a highly non-linear landscape is present. Since the power industry exhibits highly nonlinear pricing and demand scenarios, the benefits that accrue are illustrated in a subsequent section. Since SMEs in other industries may also benefit from the suggested framework; a couple of additional coaching points appear worthwhile.

Referring to the right hand side of the framework, detailed analyses of business and IT innovations are almost always a good place to start under the Baldrige total systems umbrella as outlined above. When significant-quantifiable market growth potential has been established, a meaningful approach is to next examine the potential additional core competencies that could benefit the organization's current product and service offerings. Often it helps to think of internal-external partnerships, strategic alliances, or joint ventures. Such an exercise is mutually beneficial to the existing business unit and the viable additional unit. Imagine what our competitive landscape would look like if we had both capabilities. Now implement a make-buy decision process and re-synthesize combined business and IT solutions. Helpful questions are: What new benefits exist for exiting our core technology customers? How do the new growth markets contribute to our existing markets? Are we cannibalizing our existing markets or supplementing them?

An "Ah ha or eureka" moment often occurs when we ask: **Does the company's DNA need to change?** The Baldrige definition almost always creates such a business conflict-opportunity. A focus on **mutually beneficial core competencies that result is** helpful in diminishing the emotion and getting on with the change process.

Describing the Conceptual Framework Given in Figure 1

The Baldrige criteria illustrated in Figure 2 implements major improvements every two years. Although the triple bottom line of people, planet and profit has been around for several decades; organizational sustainability was called out in these specific terms for the first time in the 2011 - 2012 updated criteria[15]. See Ed and Jean Stead's seminal work on "pursuing the triple bottom line" (2014)[11]. Furthermore, in the 2013 -2014 upgraded criteria Innovation is introduced as a non-linear event. So at the top of the framework in Figure 1 we start with the Total Systems Approach embraced by the criteria of Figure 2. Then we recognize the need for both Innovative Technology to maintain a competitive advantage in the global competitive arena on the right hand side; and Business Innovations on the left hand side to ensure sustainability of the organization itself. Business model refinements resulting from an iterative analysis and synthesis processes systematically links these two non-linear events and may become a fundamental contribution of the framework.

Timmons and Spinelli have developed a process for teaching the fundamentals of new venture creation that captures the essential steps of an approach to the commercialization of new technology.[12] These steps with some small but impactful differences are divided into two phases

and ten steps in Exhibit 1. We found that introduction of a formal strategic planning step (see Baldrige category 2); with specific partnerships as a strategic orientation much earlier in the overall process provides significant risk mitigation when Small Business Innovation Research (SBIR) Grants are considered. Here is a significant advantage that the SME has that is not afforded to the large organization. The subtle, but hugely important from a sustainable competitive advantage view, is that ownership of the intellectual property (IP) resulting from the execution of the SBIR Grant is retained by the small technology based business.

Now let's briefly walk through the ten step process given in the two phases shown in Exhibit 1 by considering the use of technology to achieve an expansion of a SEM's core business; perhaps by creating a new or additional business unit. The first step in Phase 1 consists of applying an entrepreneurial thought process to identify an opportunity in a viable new technology business opportunity. Is it any wonder then, that engineering and doctoral level technology individuals have difficulty in modifying their brilliant technological innovations? However, such tailoring is critical in attracting investors in the commercialization process.

The 10 step process summarized in Exhibit 1 draws heavy on the seminal work of Timmons and Spinelli; and has been adapted from teaching commercialization of technology experience over the past 20 years. Unfortunately this great pioneer in entrepreneurship education, Jeff Timmons passed in 2008.[12]

The fundamental teaching point in Phase 1 is that best ideas create value for customers willing to pay a premium in order to be viable and attract investors. However, in BTES's case discussed below, when the CEO has the courage to take these risks, other benefits accrue. Often these other non-financial payoffs are important to the organization's sustainability. This is an area worthy of future research; and will result to a tailoring or modification to the places where "*willing to pay a premium to receive"; and "price increase for the same or similar value is rewarded"; are used in the discussion throughout this article.*

For this discussion we find that three tests/filters/gates must be passed; and then the business concept benefits when subjected to early external review by a panel of experienced small business owners, angel investors, and financial analysts with experience in commercializing innovative technology. Perhaps this early review can be thought of an expanded "Shark Tank" review using "Apple's 10 -20 -30 Rule": your presentation consists of 10 charts; is 20 minutes long, and has font size no smaller than 30. Although students are encouraged to practice and give their elevator pitch (60 -90 seconds in duration, summarizing why their idea has merit) in class they give their initial presentation to the Review Panel with no additional coaching. Typically in a 16 week semester this Review Panel Presentation with written feedback occurs at week five and is a traumatic experience for highly technical master's degree level students.

Armed with constructive feedback Phase 2 is launched with a formal strategic planning process with a heavy marketing focus. Two exercises are very helpful in this regard. The first exercise provides answers to three key questions: 1) what are your key success factors? These are the three to five overarching objectives that must be accomplished to ensure your success in the market place and often focus on gaining strategic leverage. When a new venture has strategic leverage a price increase for the same or similar value is rewarded by increased sales; when a

new venture does not have strategic leverage they are often in a price only competition. 2) How does your value proposition lead to a sustainable competitive advantage? Answering this question in the Baldrige contest is double challenging because Innovativeness in Technology is non-linear; and the Sustainability metric is difficult to quantify without a non-linear thought process. Given answers to these first two issues the final challenge becomes; 3) what is your plan of action to assess your market potential and deploy your strategic plan?

Experience suggests that steps six through 10 represent real learning opportunities for engineers who have been selected to manage project teams or technology based functions within an organization. Although funding innovative growth within an existing technology driven organization may appear easier than for a brand new startup; in many instances it is even more challenging. Financial plans should include time to positive cash flow, income and balance sheets, an investment timeline tied to specific milestones, and a return on investment analysis. When seeking outside investments specific partnerships with universities often provide significant risk mitigation when Small Business Innovation Research (SBIR) Grants are pursued by new technology ventures. These partnerships are mutually beneficial in nature, and are explored much earlier in our approach than the classic new venture literature.

Given a detailed business plan a final presentation is given to the review panel; and written final plan is also a course deliverable. Panel feedback is given verbally and a written feedback report is provided for each proposed entrepreneurial venture. Typically, improvements between week five and 16 are rather dramatic.

Illustrating the framework with the BTES Success Story

A caveat is important as we discuss the BTES case; their CEO always had the vision and a plan to use the broadband over fiber optic cable to improve reliability of the electric system while lowering electric system cost. What if the electric system owned all of the fiber optic system that it used and charged the broadband system for its use of the fiber optic system thereby helping the electric system have higher reliability at a lower cost? Both the electric system and the broadband system could greatly benefit from these synergies. Then electric customers and the broadband customers would benefit from increased reliability and level of service options with decreased cost to the customers. So with that backdrop, it is still helpful to share the BTES success pathway because it may help others that choose to follow a similar approach to dealing with innovations that are by definition, non-linear in nature.

Furthermore, although the CEO had the **vision** of what the future electrical power distribution system **could** become; effective and efficient ***engineering and engineering management*** was essential to achieve what the future electrical power distribution system w**ould** become. From an academic prospective creating a teaching and learning environment where graduate students capture the nuances of the difference between ***could and would*** often is the difference between success and failure! We firmly believe that the conceptual framework given in Figure 1 helps guide engineering instructors in the process of creating such a teaching and learning environment. To the extent that our colleagues find this to be true, a contribution will have been made.

Highlights of BTES journey are given in Figure 2. Please see Parker's excellent narrative of the early years and challenges overcome in this journey.[17]

From the academic perspective of enhancing graduate engineering and engineering technology students' management and innovative problem solving skills several accomplishments summarized in Exhibit 2 are noteworthy. First, the need for detailed planning is critical. Until the detailed business plans were developed and presented, we cannot imagine a situation where a SME's board would approve $25 to $60 million dollar investments; regardless of the CEO's vision of what could become possible. This in fact has nothing to do with the individual CEO's track record, capabilities or desires and drive. It has everything to do with a board's fundamental fiduciary responsibilities. When dealing with a CEO's vision it is by nature so broad and expansive, it is simply impossible to critique with a fact-based approach. However when plans with sufficient detail are presented sensitivity analyses are then possible and board members can address important impacts. In this particular example, questions that had important consequences were: "What if your success is greater than what you forecast? How will you ensure that you do not outrun your capital?" These insightful questions when answered appropriately help to turn emotional arguments into fact-based results. The authors' experience suggests that SME's can be too successful, outrun their capital and be forced to sell, give up too much control or merge with another organization in order to survive. With proper guidance outcomes these may not result is a complete catastrophe. However, in spite of financial rewards, technology based entrepreneurs are often frustrated by the loss of freedom that results.

Exhibit 2: Building a Broadband Community

- **The Innovative Information Technology**
  - Three students from BTES were taking the second author's course in innovative entrepreneurship.
  - This school project asked for a twenty-five million dollar investment and if successful could have grown to over $60 million by 2015.
  - This "start-up" of a new broadband business unit had a project risk mitigation plan embedded in the plan.
  - The project explained how to spend funds **not how to obtain the funding!**
- **The Broadband Technology Challenge**
  - The plan forecast an initial $25 million dollar investment, with forecast investment growth to $60 million along the ten year commercialization path.
  - Although the students had a well thought out business plan and integrated the customers' needs into their analysis; the financial risk was very high.
  - From an entrepreneurial perspective this plan would have had difficulty in attracting investors based upon the broad band business alone.
- **The Innovative Information Technology Challenge**
  - The plan forecast an initial $25 million dollar investment, with forecast investment growth to $60 million along the ten year commercialization path.
  - Although the students had a well thought out business plan and integrated the customers' needs into their analysis; the financial risk was very high.
  - From an entrepreneurial perspective this plan would have had difficulty in attracting investors based upon the broad band business alone.
- **Solving the Combined Business and Technology Problem**
  - The **game changing innovation** occurred when the BTES CEO solved the **combined business and technology problem**.
    - What if the broadband capability also provided improved reliability of the electrical power distribution system? By asking this question Mike Browder viewed the organizational sustainability issue from a combined technology and business perspective. BTES's broadband service was successfully operating in the black within one year, an impressive nine years ahead of the technology-only commercialization plan.
    - Bristol has been transformed into a multi-faceted energy and communications technology community.
      - Every customer with access to 1 gigabit per second of bandwidth capability
      - Service offerings are moving toward a smart grid power system

One further example underscores the need to include the dynamic change of technology and its influence on the result of the combined non-linear business and technology solution over time. Exhibit 3 illustrates how need to cycle through the detailed business and technology loops in Figure 1 at different points in time.

Exhibit 3: Should Video-on-Demand as a Broadband Offering?

Was BTES VOD (Video-on-Demand) ready?

BTES launched Cable and Internet October 2005

- Cable packages were launched without VOD content; however, BTES Competitors offered cable packages with VOD content
- Student team worked with VOD equipment and content providers to get quotes – analyzed differences
- Several vendors provided proprietary hardware that would need updating
- Annual maintenance fees were also required
- Content providers required monthly minimums

Using the Total Systems Approach and the CAPDO method, the student team determined that BTES should not move forward with implementing a VOD platform.

Assess to growth strategies – reviewing the growth strategies it was determined that the digital /basic penetration needed to be at 35% to implement the VOD platform.

Update of Technology – IPTV
Total Systems Approach again
This new technology allowed BTES to add new channels and VOD content
Continued reliability

The competitive nature of the Broadband industry caused the BTES senior management to explore the question of offering Video-on-Demand (VOD) in 2005. Using the detailed comprehensive methodology captured in the right hand side of Figure 1 and the detailed business planning approach shown in Exhibit 1, a graduate student engineering technology team as their capstone project for the MS in Engineering Technology and concluded that a 35% market penetration was necessary to make VOD viable from a business investment perspective. However, the terms and conditions of the vendors became untenable restrictions on the overall growth of the BTES business. As a teaching and coaching point this becomes an excellent example of the use of technology and its impact on current and future business outcomes.

The "eureka" in this teaching and learning illustration of the framework (see Figure 1) occurs when the IPTV (Internet Protocol TV) was successfully deployed. Then VOD became viable because the system limitations that previously evaluated were removed by the IPTV technology.

Concluding Observations

The three primary aims of this study were to: 1) Provide an overarching performance excellence framework for a Baldrige Based Approach to Building a Broadband Community;
2) Recommend a non-linear thought process to refine the organization's business model based upon their marketing of innovative technology; and 3) Systematically apply a combined marketing and technology development/deployment approach that is significantly different from the marketing approaches taught in many MBA programs. Collectively and perhaps

independently the results discussed in some detail in this article make a contribution by addressing the challenge faced by many SMEs of successfully using technology to compete in the global business arena. Like it or not, once we are on the internet we are exposed to the global competitive arena with many of its threats and opportunities. Our experience indicates that the framework offered in Figure 1 is a guide both in theory and in practice.

For example, in one engineering management session during the 2013 ASEE Annual Conference an argument was made to eliminate marketing from the graduate engineering management curriculum. Perhaps our presentation can shed some light on that debate while we gain from the peer review and exchange that always help improve the experiential dimension of our engineering and engineering management curriculum.

Exhibit one provides our current baseline for teaching innovative entrepreneurship to masters of business and masters of engineering technology students and has been embedded with lessons learned on our journey over the past 20 years. This article brings out and discusses several Engineering Management Implications and may merit detailed discussion during the 2015 ASEE Annual Conference. Here are some points that could stimulate further dialogue.

1. How can a non-linear thought process be taught to help engineering managers refine the organization's business model based upon their marketing of innovative technology and/or the innovative use of existing technology?
2. What is the role of partnerships between institutions of higher learning, business and industry in developing and commercializing Intellectual Property?
3. Is it necessary for engineering students to have "skin in the game" to make experiential learning productive?
4. How can the Baldrige Process be tailored to meet the needs of an overarching system, measure the effectiveness of technology based businesses, while also providing processes from which others can learn without detracting from the those elements that are currently successful.

Here are some of our findings that could contribute during this discussion:

1. Strategic planning is not included in many engineering management programs that teach design and development of new or innovative technology. How then can strategic alignment be achieved by the organization's engineering management?
2. Development of mutually beneficial partnerships, trade secrets and IP are only considered at the very end of the business planning process. How then can risks be mitigated and / or shared to make major growth possible?
3. Without skin in the game the risk-reward reality can be lost and failures become fears rather than employee development opportunities.
4. In order to control a function we must be able to measure its output? How do we know we have the proper metrics and rubrics?

[1] Christensen, C.M. and Bower, J.L. (1996), "Customer Power, Strategic Investment, and the Failure of Leading Firms." Strategic Management Journal, Vol. 17, No. 3, 197-218.

[2] Electric Power Research Institute (EPRI) Report (1996): See LBNL-58164 "Cost of Power Interruptions to Electricity Consumers in the United States (U.S.)" (2006).

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[4] Porter, Michael. (2008). Harvard Business Review. Five Competitive Forces that Shape Strategy: See http://www.exed.hbs.edu/assets/documents/hbr-shape-strategy.pdf

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