STARS

University of Central Florida
STARS

Faculty Bibliography 2010s | Faculty Bibliography

1-1-2011

Strategic management of a transformation in a multi-program technology program involving convergence and divergence of programs: observations from NASA

Tim Kotnour
University of Central Florida

Tim Bollo

Find similar works at: https://stars.library.ucf.edu/facultybib2010
University of Central Florida Libraries http://library.ucf.edu

This Article is brought to you for free and open access by the Faculty Bibliography at STARS. It has been accepted for inclusion in Faculty Bibliography 2010s by an authorized administrator of STARS. For more information, please contact STARS@ucf.edu.

Recommended Citation

Kotnour, Tim and Bollo, Tim, "Strategic management of a transformation in a multi-program technology program involving convergence and divergence of programs: observations from NASA" (2011). *Faculty Bibliography 2010s*. 1502.
https://stars.library.ucf.edu/facultybib2010/1502

University of Central Florida
STARS
Showcase of Text, Archives, Research & Scholarship

Strategic Management in a Multi-Program Technology Program Involving Convergence and Divergence of Programs: Observations from NASA

Tim Kotnour[1], Tim Bollo[2]
[1]Industrial Engineering & Management Systems, University of Central Florida, Orlando, Florida USA
[2]Kennedy Space Center, Kennedy Space Center, Florida USA

Abstract--This paper contributes a framework for dealing with complex, technical program transitions. This paper offers a framework of strategic management tools. Tools such as scenario planning, organizational roadmaps, objectives, and measures are integrated into a systematic planning process. Using the KSC response to the new NASA Vision for Space Exploration, this paper offers a framework of strategy tools that leads from initial analysis to the business plan. An engineering manager can use this paper to follow a simple set of steps and tools to help manage strategy for an organizational transformation.

I. INTRODUCTION: TRANSFORMATIONS REQUIRE STRATEGIC THINKING AND MANAGEMENT

Government organizations, as with private organizations, are being required to change their present operations to align with the ever-changing environment [20]. Often this need for change leads to a large-scale transformation, including a change in mission or core business. With the change in mission, the organization must also change the manner in which it completes its core business; that is, it's processes, tools, and people.

Increasingly organizations are undergoing large-scale performance improvement and change efforts such as total quality management, reengineering, and downsizing. An organizational transformation is redefining an organization's business (e.g., mission and products/services) and the way the business is operated (e.g., processes, technology, people, and culture) [7]. A fundamental innovation and change problem is to determine the best way to ensure successful implementation of a performance improvement approach by overcoming barriers to change [10]. Other authors have identified critical success factors necessary for successful large-scale changes [1] [5] [14] [18] [20]. Their findings highlight the need for an organization to: 1) clearly understand the change's forces or drivers; and 2) design actions which produce positive and minimize negative results. These authors found that 1) strategic, systematic actions lead to more positive results; 2) a change without planning leads to negative results for the organization; and 3) the potential positive and negative results from an action must be understood before action is taken. An integrated change approach can help ensure the positive results are achieved. Sink and Morris [23] offer nine integrated "fronts" for successful change to ensure positive results are achieved. We group these fronts with other research findings to define groups of action an organization can take to enable successful change. The four groups are: leadership, project management, learning, and systematic change.

II. LITERATURE REVIEW

In response to the shift to a knowledge-based competitive environment [8], organizations are increasingly undergoing large-scale performance improvement and change initiatives such as total quality management, reengineering, and downsizing. However, over 70% of the change efforts are failing [6]. Some of the failure can be due to a mismatch in the initiative's goals with the internal and external issues driving the organization to change. Aligning the organization to the external environment can vary among three levels: organizational automation, enhancement, or redefinition [7]. An organizational transformation is the redefinition of an organization's business (e.g., mission and products/services) and the way the business is operated (e.g., processes, technology, people, and culture). To help organizations implement a transformation, this research will answer an executive's question: What are the integrated and sequenced activities we need to perform to ensure a successful transformation?

Best practices from organizations who have successfully conducted transformations point to the need for a systematic approach to managing the large-scale change [5] [13] [16] [20] [24] [25]. From these previous studies we found that a strategic, systematic orientation to the change led to organizations retaining the necessary skills to successfully complete their work processes. However, without a systematic approach, results were negative. Typical negative results were losing institutional memory, knowledge, and skill to perform the work resulting in a decrease in quality, improvement/innovation lacking, and employee burnout. These results occurred because the organization did not systematically plan the transformation or instead of systematic planning, relied on solutions such as across the board cuts or attrition to reduce the workforce. Organizations need an integrated approach to drive systematic, positive change. Authors such as Kanter, Stein, and Jick [14] and Kotter [15] provide further insight into the key factors for leading change. The research implications include that an organization must: design actions which produce positive and minimize the negative results; clearly understand the forces or drivers of the change; employ strategic, systematic actions that lead to more positive results; recognize that a change without planning leads to negative results for the organization; and fully understand the potential positive and negative results of an action before that action is initiated. From the literature, we've found that five elements are required for a transformation:

- ***Successful transformations are leadership driven.*** Leadership is the set of actions that engages the

organization in making the transformation a reality by providing a context and environment for change [15]. Leadership actions include: establishing a sense of urgency; establishing a guiding coalition/infrastructure and process; communicating, providing symbols, signals, and rewards; and managing internal and external politics [14] [15] [23]. Lawler, Mohrman, and Ledford [17] did find that leadership is related to successful change initiatives. Simons [22] found that senior managers differ in their use of leadership actions to drive organizational change.

- ***Successful transformations are project managed.*** Project management is the planning, organizing, directing, and controlling of resources to accomplish a set of objectives. Project management integrates transformation efforts and provides management information. Project management has been defined as a need to ensure successful change [10]. Kanter, Stein, and Jick 14] suggest the need for implementation planning but do not provide specific project management details for a transformation. Planning the transformation involves defining transformation goals and objectives, stakeholders, and risks; integrating tasks, responsibilities, and timelines; and establish the management, implementation, and informational infrastructures and process [16] [23]. Empowering change teams leads to systematic organizing and directing. Control of transformation involves using standards, measures, and feedback mechanisms; and conducting regular status and review meetings. Throughout the transformation, the project management structure helps the organization respond to barriers and new opportunities for change.
- ***Successful transformations involve continuous learning.*** Learning is the creation, sharing, and applying knowledge [2] [12]. Learning provides the real-time knowledge needed by the organization to adjust to the changing environment. Learning includes the activities to support the organization in: developing leadership[15], learning from other organizations; learn from the organization's own experience; continuously improving the transformation approach; and educating and training the workforce in successful transformations. Mukherjee, Lapre, and Van Wassenhove [19] and Hatch and Mowery [11] found learning to supportive of change in the manufacturing environment.
- ***Successful transformations involve a systematic change process.*** Systematic change approach aligns customers, products/services, processes/tools, structure, and skill mix. The systematic change approach involves a set of processes and tools to help the management team make a series of start, stop, and continue decisions. Given the different types of change needed [7], the organization must match the improvement initiatives (e.g., continuous improvement or reengineering) with the need [9] [17]. The organization must understand existing processes, define requirements for new processes, and evaluate the existing processes against the requirements [3]. The organization must align its processes by *stopping* non-matching processes, *continuing* matching processes, and *starting* the new processes needed to fulfill the newly defined future state and core business. Continuing processes must be evaluated to determine if the process can continue as is or requires an improvement or innovation to more closely align with both the future state and the possible resource reduction and changing customers' needs.
- ***Successful transformations are strategy driven.*** A transformation is a complex and timely activity to undertake. One of this first steps in achieving successful change and transformation is to create a vision of the future. Strategic planning has been offered as a method to drive organizational change. However, to drive and sustain the change, strategic planning must evolve from strategic management. Strategic management is a continuous process aimed at aligning everyday actions with the long-term direction of the organization based on the needs of the customer or the organization. An organization can use strategic management to achieve a set of strategic outcomes and create a set of actions to move the organization towards those outcomes. However, the organization must first understand the long-range, strategic nature of an organizational transformation as compared to a more short-term orientation towards day-to-day operations.

Many different perspectives can be taken to understand how an organization can successfully transform. The intent of this paper is to explore the strategy process to address a large-scale transformation. The other four elements defined above are not addressed in this paper.

III. 2.0 KSC AS A CASE STUDY

This paper's objective is to provide insights for using a strategic management process to execute large-scale transformations. The insights come from reflection on the John F. Kennedy Space Center's (KSC) use of strategic management to drive its transformation. This paper contributes a framework for dealing with complex, technical program transitions. Using the KSC response to the new NASA vision, this paper offers a framework of strategy steps and tools. An engineering manager can use this paper to pick the set of tools to help manage strategy. To learn from this case, we provide the following:

- Description of the changing environment that is driving the transformation
- Implications of the new environment to NASA and KSC
- Review of the strategic thought process to address this transformation.

From this case, we define conclusions and implications for the engineering manager.

IV. THE CHANGING ENVIRONMENT

In January 2004, President Bush [4] announced the new the Vision for Space Exploration calling for humans to return

to the moon by the end of the next decade, paving the way for eventual journeys to Mars and beyond. The President stated it would give NASA a new focus and clear objectives for the future. "We choose to explore space because doing so improves our lives, and lifts our national spirit." Basically, the vision calls for completing the International Space Station (ISS) and retiring the Space Shuttle Program (SSP) by 2010 while concurrently implementing human and robotic missions to the Moon and eventually Mars. Although NASA and the space industry/community overwhelmingly greeted the Vision with enthusiasm, it was clear the vision was the source of profound changes for NASA. How would NASA plan for these changes? What kind of strategic management would be useful?

V. IMPLICATIONS OF THE NEW ENVIRONMENT TO NASA

Upon close inspection, the Vision would require NASA to be adept at maintaining and yet changing course in its technology, structure and management. For example, some of the significant assignments to NASA were:

- "… Shuttle to complete assembly of the International Space Station; and
- "Retire the Space Shuttle as soon as assembly of the International Space Station is completed, planned for the end of this decade…"
- "…no later than 2008, initiate a series of robotic missions to the Moon…"
- "…the first extended human expedition to the lunar surface as early as 2015, but no later than the year 2020…"
- "…develop and test new approaches, technologies, and systems, including use of lunar and other space resources, to support sustained human space exploration to Mars and other destinations" [4].

To add to the challenge, NASA would have to accomplish all this and more with no change to the budget. In summary, NASA would have to:

- *Maintain two significant ongoing programs (SSP and ISS).* Alone, each of these programs represented enormous technical challenges; together they are one of the greatest technical accomplishments of mankind. Keep in mind, when the President presented this Vision, the SSP was still recovering from the Columbia tragedy. The complexity of launching, assembling, maintaining, operating and recovering these systems is more than formidable. Additionally NASA must develop access to the ISS after SSP. The challenge was to return to flight and then continue operating two highly complex and complicated programs without significantly increasing costs.
- *Within six years, complete and then retire NASA's largest program (i.e., SSP).* The SSP is the largest single program in NASA. The cost is enormous. At KSC it pays for over 80% of the infrastructure and employs almost 50% of the KSC workforce. It has utilized a whole generation of mangers, engineers and technicians. Some of that infrastructure and workforce will be useful to the new programs while the rest will be discontinued. Once the job is done, the more quickly the SSP shuts down the sooner resources will be free for other endeavors. The challenge is to close down this program quickly and efficiently without detriment to the ongoing programs.
- *Within the next four years, initiate a robotics program.* Although NASA has a wealth of experience in robotics exploration, robotics missions typically require a decade or more for planning and execution. The challenge for these missions is to make them happen in time to support the human missions.
- *No later than fourteen years, put humans back on the Moon.* This is a totally new program. The Shuttle cannot go to the Moon, its systems are aging and the technology out-of-date. Clearly there is a need for new technology.

These challenges created a set of questions: How much new verses existing technology can be used? How can we use the SSP workforce and skills? What can we use from the SSP? For the new program, which center gets what work? How do we do all of this within a fixed budget that included operating the ongoing programs? Basically this was the buildup and initiation of a new national program.

VI. CHALLENGES THE NEW ENVIRONMENT CREATED: HOW WOULD NASA AND MORE SPECIFICALLY, KSC PLAN FOR THIS?

To understand the affect this would have on NASA and KSC, it would help to review NASA and KSC's state of affairs. Congress enacted the National Aeronautics and Space Act of 1958 to provide for research into problems of flight within and outside Earth's atmosphere and to ensure that the United States conducts activities in space devoted to peaceful purposes for the benefit of humankind. Currently NASA is structured to both pursue its missions as well as manage a significant infrastructure. Leading the effort is NASA Headquarters in Washington, D.C., along with ten Centers located around the country. To manage and execute its Congressionally assigned tasks NASA Headquarters is organized into four Mission Directorates: The Aeronautics Research Mission Directorate, The Science Mission Directorate, The Exploration Systems Mission Directorate, and The Space Operations Mission Directorate. Each NASA center has an assigned specialty that supports programs generated out of the mission directorates. The KSC assignment has been and is flight hardware and payload launch processing, launch and landing operations. In addition a center may be delegated the overall management of a program. KSC manages the Launch Services Program (LSP).

The relationship between NASA Headquarters, the Mission Directorates and the NASA centers is described in

the NASA Strategic Management and Governance Handbook:

> "NASA's success is dependent upon a proper balance of power between Headquarters and Centers. Headquarters has responsibility for providing the strategic direction and oversight of NASA's mission. The Centers are responsible for execution of the mission through programs, projects, and institutional assets. Successful mission outcome requires an appropriate level of tension" [21, p. 14].

In addition to a balance of power, NASA adheres to a philosophy of "Sensible Competition." The NASA Strategic Management and Governance Handbook describes this as:

> "The goal is to have a balanced approach to competition and institutional health. Competition should be used as a tool to promote best approaches and solutions, and to encourage innovation and efficiency. …At the same time, the Agency must maintain a balanced approach to competition that benefits NASA without undercutting the essential competency of the organization. In order to preserve institutional competency, NASA should foster competition when it helps achieve the mission" [21, p. 10].

Further complicating the situation is how NASA structures itself as a government managed business. With eleven centers and a multitude of programs, the intent is for both the programs and centers to compliment each other in an interdependent network of support. Each center and each program have specific assignments to fit within this network. Although this administration has been very supportive in the budget, like all government entities there is never enough. The result, all of NASA is an environment of limited resources and workforce. NASA has an intentional competitive management structure with a mixture of overlapping and divergent technologies trying to transition major programs. Consequently, there is competition, conflicting interests and at times, open divergence between the programs and centers. They are competing for what they see as their "fair share" of budget, workforce and most importantly, assignment of responsibilities. To successfully compete, programs and centers must have their own implementation plan and a set of implementation goals that closely, if not exactly, resemble a strategy and strategic goals.

Within this overall philosophical structure, KSC must support the NASA missions and manage an infrastructure all with an environment of balance of power and sensible competition. Undoubtedly this situation required a strategic mindset to operate successfully. KSC would have to fit its strategic activities within the overall NASA strategy.

VII. STRATEGIC IMPLICATION TO KSC: STRATEGY FORMULATION AND IMPLEMENTATION IN AN ENVIRONMENT OF PROGRAM AND CONVERGENCE AND DIVERGENCE

Clearly KSC needed to respond to this changing environment. The situation was far too open to allow events to drive KSC. For NASA's and its own welfare KSC needed to understand the future and prepare. It quickly became apparent that the many interrelated variables as well as outcomes from the vision created a very complex planning situation. KSC would need to produce a rigorous and cohesive approach. This put KSC on a path of creating a planned course of actions using a set of strategic tools that would eventually be incorporated into a business plan. To address this situation, KSC followed a set of steps and used strategic planning tool. Figure 1 below highlights these steps and tools. The remainder of this paper will discuss each of the steps and tools.

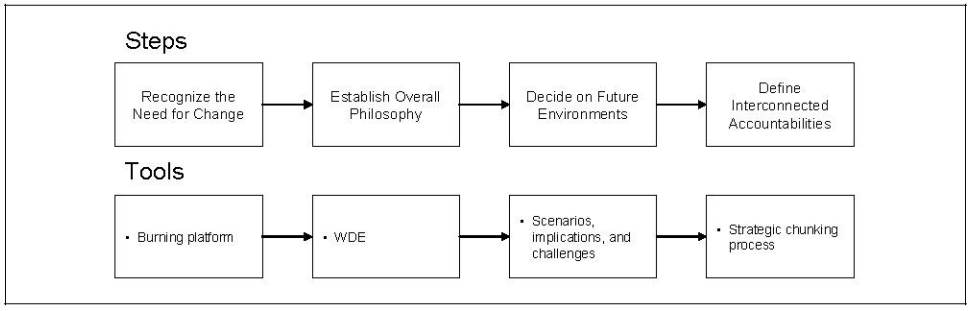

Figure 1. Summary of strategic thought process.

Step 1: At the highest level, recognize the situation calls for the need to change.

The first step is to recognize the need for change. This involves the leadership team understanding the environment and seeing the strategic implications to the organization. Strategic decisions are the sole domain of the leader. Arguably, the most important and most difficult strategic decision is whether to invest in strategy at all. For KSC, this was recognizing the implications of the VSE. KSC senior management recognized this need and established the Vision Transformation Team. This team was composed of senior managers to understand the strategic implications of the VSE. This group was taksed to define KSC reason for change.

Tool 1: Burning platform

The first tool used is a called a "burning platform." This term was not used by KSC, however, it is common term used

to describe the reason for change. For KSC, this burning platform was defined by answering a set of questions:

- What are the implications of the VSE?
- Does the center want to be proactive or reactive in response to the environment?
- How does the center want to influence the environment?
- How does the center want to develop strategies to be able to respond to the environment?
- What is the "strategic trade space"? What are the external elements? What are the internal elements?
- How can the center deal with the complexity of the elements and timing?
- What are the decisions the center needs to make?

This burning platform was used to begin further analysis and strategic thinking.

Step 2: Establish an overall strategic philosophy(ies) that guides your strategic planning.

The second step is to establish an overall philosophy. After deciding on the need to change, the next step is not readily clear. There are likely a whole set of loosely tied ideas, goals and assumptions that are difficult, if not impossible, to formulate into a lucid picture. Something must tie it together or establish a context. A strategic philosophy will do this.

KSC broke the logjam by answering a set of questions: What did KSC want to happen? What were the strategic goals/outcomes? What makes KSC healthy? The last question was the key to our final answer.

Tool 2: Philosophy for the Transformation (Work Drives Everything)

The type of work reflects the center's mission, accountability and most import, its reason for existence. The amount of work directly determines the fiscal health of the center. Changes in the way NASA did business and the direction the new programs were (at that time) taking, made this even more significant. Historically, NASA assigned and funded work that was an allocation to centers based primarily upon their traditional role. However, NASA transitioned from an allocation based budget to a full cost budget was significant to KSC. The historical allocations for technical support and infrastructure were replaced by direct charges to the programs, a service pool, or G&A. The effect was that programs have increased interest in, and at times, the primary deciders as to work allocation to the centers. The new Exploration philosophy seemed to take that a step further, they favored "contractor–led" work assignments. This allowed contractor the decision as which NASA center to allocate work, if at NASA at all. It was within this environment that KSC had to react. What does the center do about work force and infrastructure? How does it budget for new work? How will this affect the revenue for G&A? What new work does KSC think NASA should assign to KSC? To help organize these questions, thoughts, and implications KSC develop an overall philosophy.

Like many endeavors the product or work defines that endeavor. This is true for NASA and especially its centers. Out of a wealth of analysis and discussion surfaced an overall theme – "work drives everything (WDE)." WDE was the principle that a center was defined by the work that programs and NASA HQ apportion to that center. To remain a viable Center (or survive), KSC would have to become attractive to new programs and perhaps "non-traditional" activities to sustain an income. KSC would have to learn to compete in a performance-based environment. KSC came to the conclusion that its primary strategic goal was to optimize WDE. In other words accrue the right type and amount of work for KSC. This goal spawned numerous specific outcomes that KSC desired. Figure 2 provides the graphical representation of the philosophy.

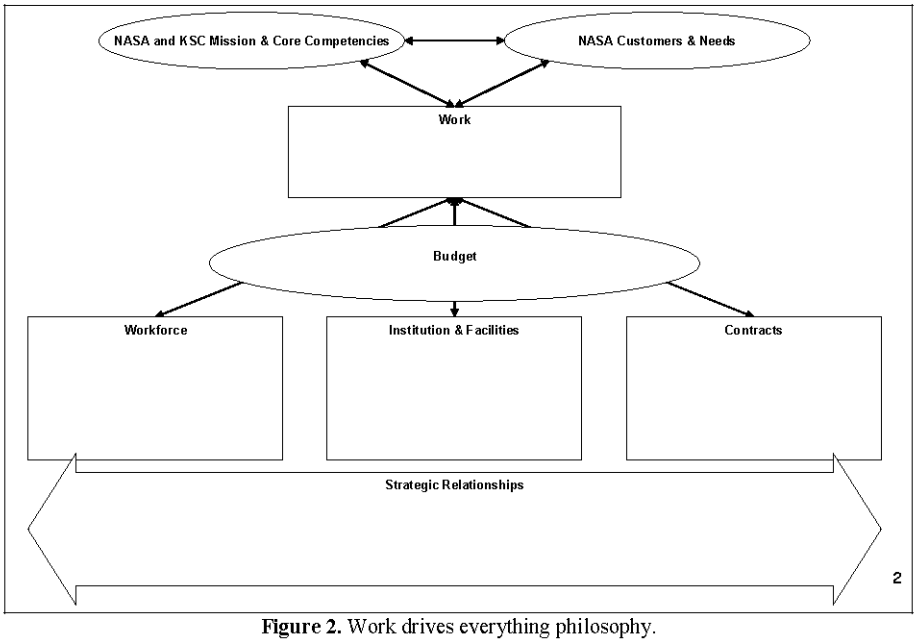

Figure 2. Work drives everything philosophy.

Consistent with this philosophy, KSC used a decision process to help identify the work it was best suited to perform to add value to the VSE.

Step 3: Decide on the future environment you want to create.

The third step is to decide on the future environments you want to create. In a transformation, the future environment is not known with much certainty. For NASA and KSC, the VSE provided a long-term direction. However, the exact environment of and path to the future were not known. Many questions about how the current program would close and the future of the new program was unclear. There was a high degree of uncertainty. To help deal with is uncertainty, the management team focused on understanding the future through scenarios.

Tool 3: Scenarios

Once the leader establishes the strategic outcomes, scenario-driven planning was and is a very useful strategic tool. The outcomes provide the baseline for scenario planning. The transition from outcome to scenario is a straightforward process. It is primarily a more detailed version of the outcome. The scenario captures the condition or configuration of the organization in light of performing the desired activities. It also encompasses the probability that the future course of events will favor your outcome or perhaps act against you outcome's fruition. This clarifies in planning if you must focus on your own activities or if you must also influence outside events to favor your scenario. Our approach was:

1. forecast the most likely future scenarios that affect or are within the scope of the outcomes
2. analyze the out comes against the future scenarios
3. assess the scenarios as to whether they supported or inhibited our outcomes (good, bad, neutral)
4. decide if we wanted to do something about them: do nothing, influence the environment, prepare for the environment or a combination.

But to do this we had to define the environments into consistent, standard and actionable parameters otherwise the whole exercise would be unmanageable. For KSC the list of scenarios became very long. There needed to be a way of assessing the scenarios against each other and end up with a list of scenarios in which we wanted to invest an effort. Figure 3 provides a summary flow of the scenario thought process. From these scenarios, implications and challenges were identified. The implications and challenges identified the strategic items the management team needed to address.

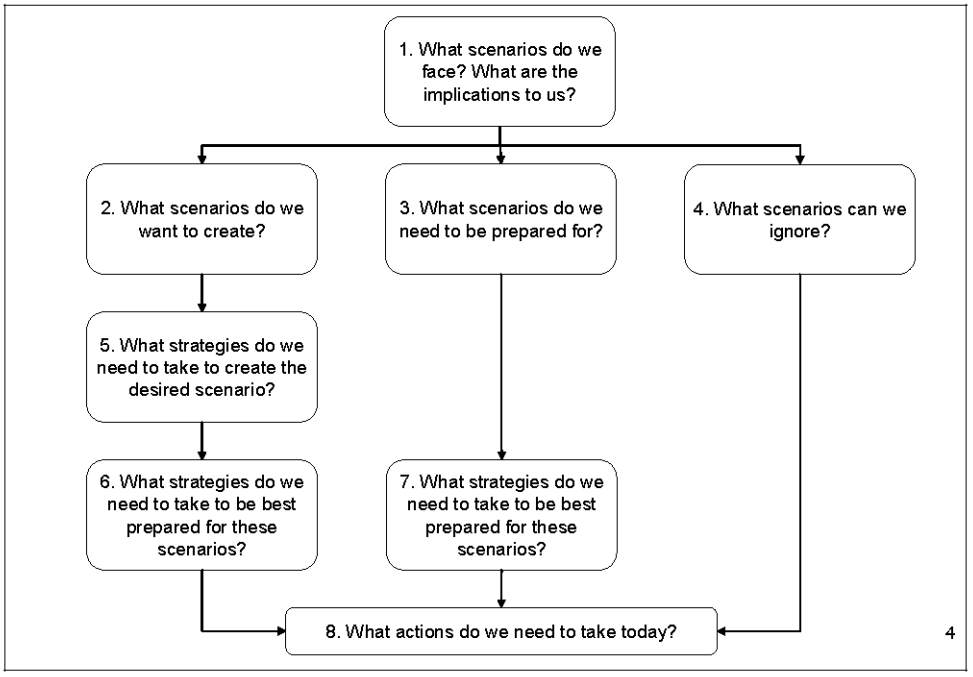

Figure 3. Scenario thought process.

Step 4: Define interconnected accountabilities.

The fourth step is to define interconnected accountabilities. In this step, the actions to achieve the desired outcomes need to be defined to create the most favorable scenario for the organization. This step is where the conversations come together to make decisions to take actions. Given this transformation is a complex transformation, the decisions and actions need to be both parsed out and integrated. They need to be parsed out to allow for discrete actions to be taken. They need to be integrated to ensure the entire organization is working on the same overall philosophy and desired outcomes. To help drive

the accountability definition an integrated process was defined.

Tool 4: Strategic Chunking Process

Figure 4 provides a graphical summary of the strategic chunking process. This process is consistent with the WDE philosophy defined earlier. The horizontal "swim lanes" of the chart are the elements of the WDE model. The vertical columns represent each step of the strategic management process: strategic planning, implementation planning, execution, and performance evaluation. This process begins with the overall strategy being defined in the strategic planning step. From this strategy, the implementation planning step begins with a definition of the work. The desired work requirements are defined which leads into requirements for the workforce, facilities, contracts, strategic relationships, and budget. Specific plans are developed. All of this comes together in the budget decisions. The budget drives execution. From execution, the performance evaluation step occurs using measures. These measure help define how well the philosophy and strategy are being achieved. This creates a closed-loop process.

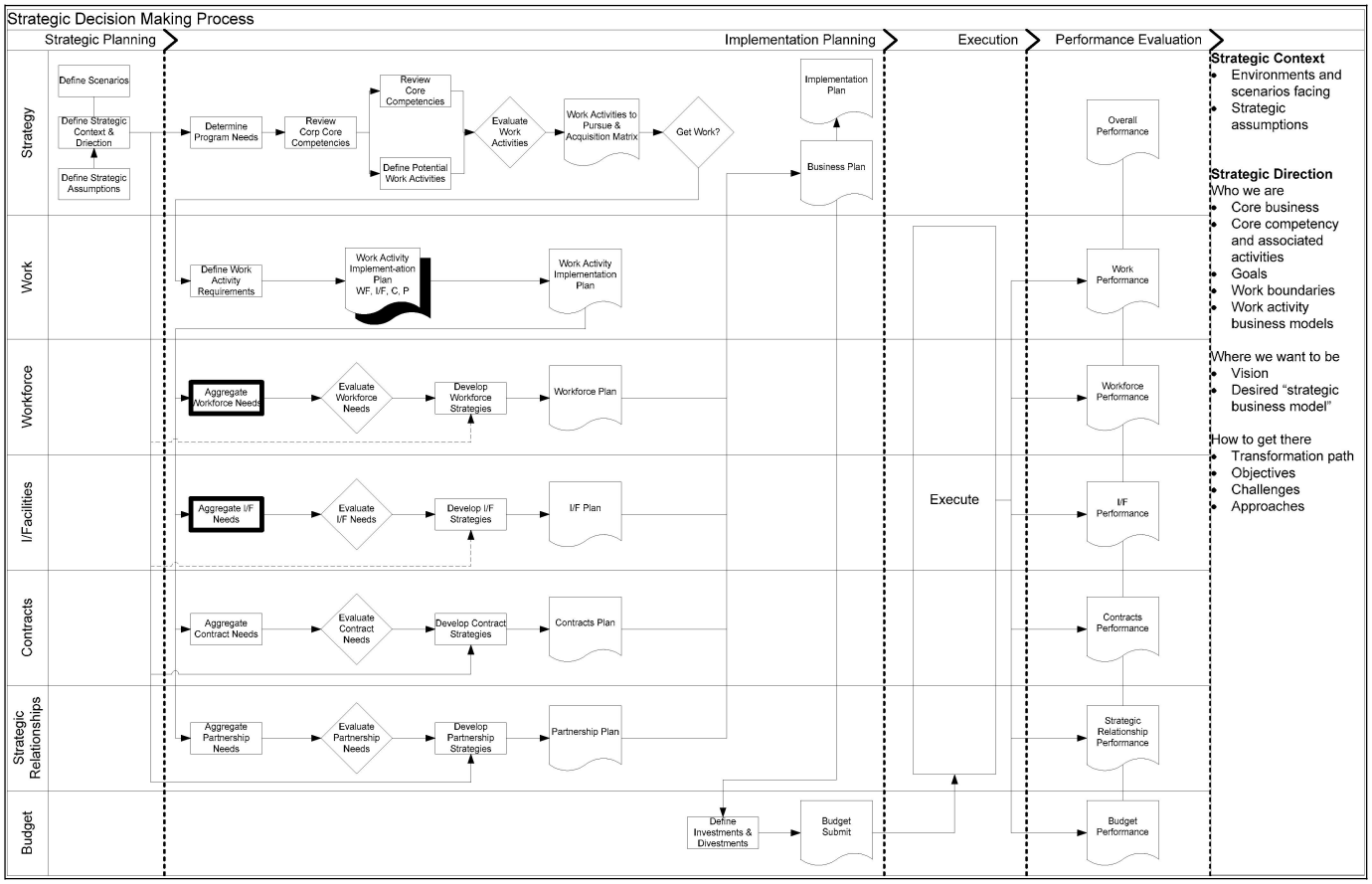

Figure 4. Strategic chunking process.

VIII. CONCLUSIONS

Major changes in the environment leads to significant strategy shifts. These strategy shifts can have profound impacts on a technical organization and the programs it operates. Some new programs are started, some current ones stopped, and some current ones need to alter their approach to meet new objectives or fit within in new constraints. The intent of this paper was to provide a framework of questions and tools to address an organizational transformation involving a technical organization involved in technology programs. The paper highlighted five elements: leadership, project management, learning, systematic change, and strategy. This paper focused on the strategy component of the transformation,

Using KSC as case study, the paper highlighted four strategy steps and a set of tools. These steps and tools represent a very straightforward approach. Much more detailed conversations are needed. These conversations are unique to the organization and its situation. An engineering manager would need to reflect on this framework and develop one that is unique to his or her organization.

REFERENCES

[1] Appelbaum, S. H., R. Simpson, and B. T. Shapiro, "The Tough Test of Downsizing", *Organizational Dynamics* v:i, pp. 68-79, 1987.

[2] Argyris, C., and Schon, D. A. *Organizational learning: A theory of action perspective*. Reading, Massachusetts: Addison-Wesley Publishing Company, 1978.

[3] Brynjolfsson, E., Renshaw, A.A andVan Alstyne, M.. "The matrix of change", *Sloan Management Review*, Winter, pp. 37-54, 1997.

[4] Bush, G. W. "A Renewed Spirit of Discovery: The President's Vision for U.S. Space Exploration", speech, January 14, 2004.

[5] Cameron, K., S. J. Freeman, and A. K. Mishra, "Downsizing and Redesigning Organizations", In *Organizational Change and Redesign*, (Eds: Huber, G. P. and Glick, W. H.), New York, NY: Oxford University Press, pp. 19-65, 1993.

[6] Champ Champy, J. *Reengineering management*. New York: Harper Collins Books, 1995.

[7] Davidson, W. H. "Beyond re-engineering: The three phases of business transformation", *IBM Systems Journal*, 32:1, 1993.

[8] Drucker, P. F. *Post-Capitalist Society*. New York: HarperCollins Publishers, Inc., 1993.

[9] Gadd, K.W.and Oakland, J. S. "Chimera or culture? Business process reengineering for total quality management", *Quality Management Journal*, 3:3, pp. 20-38, 1996.

[10] Grover, V. "From business reengineering to business process change management: A longitudinal study of trends and practices", *IEEE Transactions on Engineering Management*, 46:1, pp. 36-46, 1999.

[11] Hatch, N.& Mowery, D. C. "Process innovation and learning by doing in semiconductor manufacturing", *Management Science*, 44(11), 1461-1477, 1998.

[12] Huber, G. P. "Organizational learning: The contributing processes and the literatures", *Organization Science*, 2:1, pp. 88-115, 1991.

[13] Huber, G. P., and W. H. Glick, "What Was Learned About Organization Change and Redesign", In *Organizational Change and Redesign*, (Eds: Huber, G. P. and Glick, W. H.), New York, NY: Oxford University Press, pp. 383-392, 1993.

[14] Kanter, R. M., B. A. Stein, and T. D. Jick, *The Challenge of Organizational Change: How Companies Experience It and Leaders Guide It*, New York, NY: The Free Press, 1992.

[15] Kotter, J. P., *Leading Change*, Boston, Massachusetts: Harvard Business School Press, 1996.

[16] Kaufman, R. S. "Why operations improvement programs fail: Four managerial contradictions", *Sloan Management Review*, 34:1, pp. 95-100, 1992.

[17] Lawler, E., Mohrman, S. & Ledford, G. *Strategies for high-performing organization*. San Francisco: Jossey-Bass Publishers, 1998.

[18] Marshall, R. and L. Yorks, "Planning for a Restructures, Revitalized Organization", *Sloan Management Review*, Summer, pp. 81-91, 1994.

[19] Mukherjee, A., Lapre, M., & Van Wassenhove, L. "Knowledge driven quality improvement", *Management Science*, 44(11), S35-49, 1998.

[20] National Academy of Public Administration, "Effective Downsizing: A Compendium of Lessons Learned for Government Organizations", Washington, DC: National Academy of Public Administration, 1996.

[21] National Aeronautics and Space Administration, 1996, *NASA Strategic Management & Governance Handbook (NPD 1000.0)*, Washington, D.C: Author, 2006.

[22] Simons, R. "How top managers use control systems as levers of strategic renewal", *Strategic Management Journal*, 15, 169-189, 1994.

[23] Sink, D. S. and Morris W. T., *By What Method?*, Norcross, Geoegia: Industrial Engineering and Management Press, 1995.

[24] United States General Accounting Office, "Workforce Reductions: Downsizing Strategies Used in Selected Organizations", Washington, D.C.: United States General Accounting Office, March, 1995.

[25] Wyatt Company, The, "Best Practices in Corporate Restructuring", Chicago, IL: The Wyatt Company,1993.