Leading dynamically complex projects

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Abstract
Purpose – The paper seeks to establish a critical role for leaders in guiding projects to higher levels of effectiveness. This role centers on using the thinking capacities associated with systems thinking, knowledge processing, action learning, and pragmatism. It is also to design systems to imbue these capacities into the operation of project teams.

Design/methodology/approach – This paper presents a case study, action-research observations, and conceptual models. Actual case studies including a medium-sized US manufacturer and a large shipyard.

Findings – This paper includes a section that presents research findings that suggest efforts by managers to improve profits actually reduced profit in the longer term due to erroneous learning and low-quality knowledge.

Research limitations/implications – The research presented does not focus specifically on project teams, but rather on the interplay between project teams and the larger organizations of which they are part.

Practical implications – In certain industries, the performance track record of project teams for operating according to schedule and within budget is dismal. Such failures have been wrongly attributed to bad staffing, poor decision making, internal politics, or external forces. This paper proposes that the more common reasons for such failures are erroneous learning caused by misperceptions of dynamic feedback, low-quality knowledge, imbalances among system elements, and failure to account for dynamics and time delays. An approach called project management system pragmatics is proposed for use by leaders as a way to improve the effectiveness of project teams.

Originality/value – This is the first approach to project management/leadership that offers practical ways for leaders to conceive of how to deal with the ambiguities posed by the dynamics of the complex systems many project teams operate within.

Keywords Leadership, Project management, Knowledge management, Learning, Thinking styles

Paper type Conceptual paper

Introduction
Conventional wisdom holds that controlling projects ever more tightly is paramount for success. This view often stems from the belief that control alone is what leads to continuously higher levels of consistency in project performance. Conversely, such a view is often taken to imply that leading projects is not as critical to success as controlling them, and may be seen as being a potentially risky step in a dangerous direction. After all, one might conclude, leadership is often associated with the use of one’s personal power to gain influence over other people – and a loss of control. In other words, getting them to act in ways they might not otherwise behave. It encourages people to follow a person or to commit to that person’s vision of an ideal future state – as
opposed to systematically working to meet a project’s requirements, budget, and schedule. In contrast, project management approaches have traditionally relied on management processes, such as planning, organizing, and controlling – as opposed to leadership – to assure projects requirements are reliably met. The Project Management Body of Knowledge (Project Management Institute, 2004) defines project management as being “the application of knowledge, skills, tools and techniques to project activities to meet project requirements.” When taken together, management processes, the application of knowledge, skills, tools, and techniques comprise what is commonly known as a management system.

Cavaleri and Obloj (1993, p. 13) explain that a system is “a group of elements that act in concert and with some degree of coherent unity.” Further, a management system is a purposeful assembly of management tools and processes used to achieve some strategic end. Typically, elements of a management system may also include:

- structure;
- strategy;
- culture;
- procedures; and
- leadership.

In other words, project management operates both as a management system and within the context of a broader management system. Management systems may include both hard and soft systems approaches. Project management has historically relied nearly exclusively on hard systems approaches for program planning, resource allocation, scheduling, budget compliance, and control – and is driven by classical economic and engineering models. For example, PERT, CPM, and materials requirements planning (MRP) techniques all fall within this class. Flood and Jackson (1991, p. 71) define the hard systems approach noting:

... it seeks to make possible the efficient achievement of goals or objectives, taking goal-seeking to be an adequate model of human behavior; it assumes that the world contains systems which can be “engineered” hence that models of those systems can be made; it talks of the language of “problems” and “solutions” which eliminate problems.

This stands in contrast with the soft systems tradition – which assumes that goal-seeking is not sufficient to capture many aspects of human affairs and regards models as merely logical frameworks based on some view of reality, not reality itself. In the latter, the process of learning replacing the end of achieving optimization, and reaching temporary “accommodations” replaces the attainment of permanent solutions.

Typically, leadership, knowledge, and culture are considered as being key aspects of soft the systems approach. Traditionally, project managers have seen projects as clearly defined systems that behave in intrinsically linear and deterministic ways that can be rationally engineered and tightly controlled. Here, projects are often unwittingly envisioned as being no more than simple machines that operate within a framework of certainty where rational decisions produce predictable effects by means of discernable causes. While applying the hard systems approach would ideally operate upon projects with mechanical reliability and efficiency, there is less than compelling evidence to
support the validity of this view. Are such views unnecessarily naive? Sterman and Rodrigues argue that it may be so.
Sterman (2002, p. 2) observes:

Project management is at once one of the most important and one of the most poorly understood areas of management. Delays and cost overruns are the rule rather than the exception in construction, defense, power generation, aerospace, product development, software, and other areas. Project management suffers from numerous problems of costing and scheduling. Cost overruns from 100 to 200% are common. Projects are often delayed to the point that market conditions for which they were designed have changed. Many projects suffer from the “90% syndrome” in which the project is thought to be 90% for half the total time required. Project management is often counterintuitive.

Rodrigues (1997, p. 1) is even more critical in his evaluation of the performance of traditional project management approaches:

As projects grow complex, and “project failure” is appallingly a major trend in the several areas of economic activity, the traditional approach to Project Management has proven ineffective to cope with complexity, and hence new more sophisticated techniques are needed to improve performance.

This evidence suggests projects tend to be rather complex dynamic systems characterized by counterintuitive behavior in response to conventional management approaches. Our estimate, contrary to prevailing view of projects, is that projects defined as being dynamically complex are the rule, not the exception. It is arguable that more than half of all major projects may be considered to be dynamically complex. We propose such projects can be more effectively controlled by using a combination of approaches that form the basis to a new approach to project management.

Foundations for a new approach
There are many different perspectives on project leadership. In fact, these approaches are as diverse in their focus as the leadership literature itself – ranging from analysis of personality types to designing systems to support learning in project teams. When seem from a broad view, these perspectives focus mainly on either learning/knowledge creation or individual stylistic dimensions of how leaders may exert influence over other project team members. Those theories that address learning/knowledge creation seem most relevant to this discussion because ultimately their focus in placed on explicating how project management systems can be designed to support learning and knowledge creation. Several of these approaches, such as those articulated by Sense (2006) and Turner et al. (2003) are quite robust in proposing relatively elaborate models for improving the depth of what is learned through experience in project teams. For example, Turner et al. discuss the need to capture the project experience of employees through using techniques, such as post completion reviews, and codifying the findings of these efforts in company procedures to be used as part of larger initiatives to develop new project managers and other professionals. In a similar vein, Sense (2006) proposes that in projects, constructing meaning from work experiences and learning processes are embedded in the context of tasks or work effort – or what he calls situated learning. Here, learning and work cannot be separated – in practice. He views leaders as having the potential for playing a critical role in designing new situated learning opportunities for project team members. In other words, to creates structures that help
to cultivate learning within a project environment by facilitating a project team member’s capacity for systematic reflection on their learning activities. Writers, such as Ollila (2000) argue that reflection is one of the most critical skills that project leaders need for promoting the ability for sense-making with a project team. The role of reflection is also viewed as being critical to project management success due to the need to attain greater levels of sense-making to cope with variety, uncertainty in project management environments. While it is important for project leaders to consider how learning and knowledge-creating processes can be sustained and used to support innovation, such learning-centric approaches tend to be more narrowly focused than the more systemic one we propose in this paper. While we concur that the capacity to learn, reflect, and create new knowledge is critical to developing a larger understanding of the interdependencies among the various elements within a project. When such capacities are widely shared within a project team, it becomes possible to discover new ways of understanding the fundamental forces at play within a project. Such insights can allow leaders to design policies that will take advantage of these forces by leveraging them toward achieving the project’s goals. While such forces may be easy to identify and control on some simple operational aspects of projects, others may be complex, dynamic, and challenging to decipher. Lewis (2002, p. 7) notes “it is not important that leadership be exercised all the time! There are some jobs that are routine, operations-oriented, that don’t seem to require leadership.” We concur with this observation and suggest that most projects of critical importance to companies are dynamic, non-linear in nature, and require a type of new type of leadership that accounts for the influence of high complexity in project teams.

Unlike linear, mechanical systems, complex dynamic systems are characterized by nonlinear relations between cause and effect, delayed feedback, and time-space distortions. That is, unintended effects can often arise in distant parts of a system – in ways that cannot easily be anticipated. Sterman’s (1989a, b) research on misperceptions of feedback found that actions taken within or on complex systems invariably lead to managers to misperceive the meaning of feedback. Such misperceptions usually result from ambiguity of feedback, delays in receiving feedback, and unresolved competing theories of cause and effect relations. This often produces confusion about the true nature of causal relations in such organizations. Under such circumstances, effective policy design is problematic. In the event of finding oneself challenged with the task of managing a complex dynamic project, what approach is most likely to produce effective results?

**Knowledge processing**

The literature on managing complex systems is rich, offers potential strategies for managing more effectively. Pragmatic system theorists, such as Ackoff (1974) point to the need to for continuous redesign of systems moving incrementally toward a more ideal state – while learning from experience, and converting lessons learned into knowledge. Many of the theories espoused by Ackoff and Checkland are based on the ideas of American scientist and philosopher Charles Sanders Peirce. Peirce, the founder of what is often referred to as philosophical pragmatism was the mentor to such notable figures as William James and John Dewey.

More recently, writers such as Firestone and McElroy (2003) have argued that what they term knowledge processing is a potentially effective way to improving performance
and mitigate the effects of system complexity. Writing in the tradition of philosopher Karl Popper, they argue organizational effectiveness, in complex systems, is mainly a function of changing the way problems are defined. They propose that most solutions are ineffective because the problems they were meant to solve were diagnosed based on faulty or incomplete knowledge of how the complex systems that problems are embedded within work. The underlying limitation, in their view, is that the quality of knowledge about the system that is used to define problems is of insufficient quality to enable the creation of a valid diagnosis. They propose that it is possible to raise the level of knowledge in an organization by increasing the knowledge processing capacity within the organization. A valuable contribution of this perspective is that it distinguishes between business and knowledge processes. Business processes are sequentially-linked chains of tasks and instructions for completing those tasks to achieve a specific performance goal, such as completing a customer transaction or setting up equipment in preparation for production. Whereas, knowledge processes are chains of activities designed to improve the quality of knowledge that is in use or being considered for use – by exposing its limitations or flaws. In their view, knowledge processes contribute to raising the quality of knowledge in a company over what they have termed the knowledge life cycle.

Learning in dynamically complex systems

Similarly, Thompson (2007) proposes that learning and knowledge creation are critical processes also needed to develop highly effective policies for managing effectively within complex systems. Thompson’s research was based on over 20 extensive interviews with business executives to identify the extent to which their conceptualization of the major problems they sought to solve were organized in a manner that accounted for dynamics, systems effects, and incorporated valid lessons learned from past experience. This research suggests that holding non-systemic, static conceptualizations of problems contributed to learning erroneous lessons from past experience and led to decisions that damaged performance in ways that could directly be traced back from decisions to strategies that had been formed as a direct result of these flawed conceptualizations. One such case he cites is that of Fox River Shipyard. At Fox River, decisions made by top management designed to raise profits that actually significantly hurt profitability. The shipyard’s top management was convinced that its operations became unprofitable due mainly to contractor delivery delays. A consultant was hired by the shipyard to build an elaborate model and computer simulation for the purpose of demonstrating how the actions of contractors were causing such harmful effects on the shipyard – and also to strengthen the position of the company in laying the foundation to make legal claims against the contractors for money damages. The simulation, however, could not reproduce the types of behavior that the shipyard’s management team had attributed to the effects of the contractor delays. As the result of intensive study of historical data and parameter analysis, the model and simulation strongly suggested that low profits in periods when order rates and production were at their highest was not the fault of contractor delays, but actually was due to the lack of skilled labor employed at Fox River. The company used a “learning curve model” to guide project planning in a way that forecasted, in certain employee trades, (e.g. electrical wiring, plumbing, riveting and welding) it would take about three years of experience to achieve highest productivity. These proved to be “wildly optimistic” estimations. The critical trades actually required seven to ten years of
experience in order to achieve maximum productivity. So, the unintended effect of Fox River’s management team laying-off workers during cyclical downturns in the business cycle, was actually they were laying off the foundation for worker experience and learning that would in future periods cause them to lose money. This was directly attributable to shortages of experienced workers during periods of peak activity because they did not have sufficient numbers of experienced trades-workers on staff. Thompson concludes that eliminating such erroneous and faulty lessons learned by managers is critical to promoting effective performance. It is evident from the work of writers such as Firestone, McElroy, and Thompson that managing projects is not just a simple linear process that can ignore complexity, dynamics, and the role of knowledge and learning.

Project management system pragmatics
There is a bold contrast between the conventional project management thinking and that of the systems theorists cited. The notion of achieving the optimally engineered projects by precisely employing hard systems approaches based on the conceptual foundations established in operations research, management science, industrial engineering, and Tayloristic approaches to managing seem outdated. A new approach, one that is especially relevant to the concerns of those managers charged with guiding highly complex projects, such as software development, pharmaceutical development, and construction is needed. This new approach should be based on principles established in foundational areas, such as system dynamics, leadership, systems thinking, leadership, action learning, pragmatism, and knowledge leadership. We have termed such an approach project management system pragmatics.

We propose a first step in the direction of becoming more systemically-focused and knowledge-based in moving towards an approach to dealing with complex, dynamic project management systems. We recommend several steps for project managers to move in the direction of increasing the effectiveness of dynamically complex projects in meeting requirements. These include:

1. Focus on being a project leader as well as a project manager.
2. Direct one’s leadership efforts toward building the capacity of team members to learn from experience and translate that into new knowledge of what works most reliably well in various projects.
3. Design systems that increasing organizational knowledge processing capabilities and improve the overall quality of knowledge within the project team.
4. Conceive of projects as complex dynamic systems by:
   • defining the system and its boundaries;
   • identifying the causal relations among the systems elements;
   • envision how the interactions among the system’s elements might create various imbalances and trigger certain patterns of behavior or dynamics; and
   • discover the natural state of balance that enables the system to change, adapt, renew, and repair itself.
Seivert’s (2001) five elements of success system provides a conceptual framework enables project leaders to begin to more clearly see the underlying systemic structure of projects in ways that will help them to both lead and manage these projects. Achieving balance, adaptability, and openness often requires that the entire project be seen as a whole, but the interdependencies among its parts must also be understood with respect to their relationship to the project’s goals. For example, in what is known as agile development the emphasis of project management is shifted in the favor of achieving adaptability and openness. Such approaches seek to increase the ability to quickly incorporate lessons learned from experience as well as respond to internal and environmental changes that occur over the life of the project. This requires not only strategic and systemic perspectives by project leaders, but also attentiveness to knowledge and learning among project team members. This paper provides a framework for leading projects that is based on systems thinking, action learning, knowledge leadership, and Seivert’s five elements of success.

**Project management versus project leadership**

Traditionally, project leadership has been construed as that subset of project management activities that focus somewhat narrowly on influencing team members through inspiration, motivation, and communication. We propose there is broader way of looking at project leadership. Leadership is conventionally associated with organizations, not projects. Perhaps the most important factor that differentiates the two is the limited autonomy of projects. Organizations can be nearly autonomous, free to discover a unique identity and its leaders can imagine alternate visions for the future. From this perspective, the organizational leader’s role can be said to focus on finding a path of growth and action – within this unbounded freedom – that is sustainable in a satisfactory way. Projects, on the other hand, do not have the same degree of autonomy – and therefore the role of leaders of projects is substantially different than for leading organizations. As a starting point, let us begin with the assertion that a project is about fulfilling a “promise” to customer. That promise includes an understanding of what is desired/valued, and contingencies that must be met (e.g. delivery date, maximum cost, etc.). In some projects, the value element is a detailed specification of the desired result – a set of drawings and specifications for a bridge from point A to B, for example. At the other end of the spectrum are projects such as product research and development – where a project might begin with nothing more than a user story of how someone might employ and benefit from an as-of-yet-undefined product. Certainly, many projects fall somewhere in between – having more or less defined desired outcomes with some degree of freedom to maximize an explicit or implicit value function (e.g. easier to use, as strong as possible, maximum useful life, lowest lifecycle cost, etc.). To the degree that the project promises that something of value in particular will be obtained, or certain constraints will not be breached, the project’s autonomy is limited. Projects are often defined by transactions – ones that occur – whether internal or external to the project. In short, a project is a transaction where an autonomous agent agrees to temporarily subordinate autonomous freedom to someone/something else (the customer) in return for rewards that further the autonomous intentions of the agent (or its constituents if a team) in the long run. When seen from this perspective, project management can be said to influence how effectively that transaction is made, where an effective transaction leads to the best outcome from the customer’s perspective (maximum value within the constraints) and the agent’s perspective (more money, skills,
knowledge, etc. to be employed toward their own mission(s)). Given this alternate view of the domain where leaders exert their influence on projects – what then is the project leader’s new work?

The leader’s new work
Traditionally leaders have been thought of as those who inspire other’s to achieve greatness. While this is partially true, there is more to the story of how leaders can positively impact performance. Senge (1990) envisions the work of leaders in a different light:

Leaders are designers, teachers, and stewards. These roles require new skills: the ability to build shared vision, to bring to the surface and challenge prevailing mental models, and to foster more systemic patterns of thinking. In short, leaders in learning organizations are responsible for building organizations where people are continually expanding their capabilities to shape their future – that is, leaders are responsible for learning.

While it is the new leader’s responsibility to help create organizations (or project teams) that continually support people in pursuit of their passions, individual members of an organization must also understand that experimentation and learning are necessary for success and innovation in any walk of life. Cavaleri and Seivert (2006) propose that knowledge-creating processes respond better to being led than managed. They explain that all knowledge is created through the personalized involvement of people that brings their prior learning, knowledge, belief, and reasoning to the process. Leaders can influence others to explore new ways of thinking and acting that offer powerful ways of creating new knowledge. While technology can play an important role in supporting knowledge-creating processes, it must always remain subordinate to the human process of translating one’s experience into understandings of how and why things work as they seem to in practice.

But, what do leaders apply these practices to and how do they do it most effectively? The answer to this question will vary with the specific conditions and circumstances found in every organization and project team. However, we assert that every creative entity is simultaneously dealing with five essential elements that govern its success. In ancient times, these elements were known as:

1. essence;
2. air;
3. fire;
4. water; and
5. earth.

In more modern times, western philosophers, such as Peirce, Dewey, and James have identified analogous elements with much more esoteric sounding labels. Seivert (2001) has applied these five essential elements, in more modern terms – identity, vision, mission, interactions, and structure – to a wide range of creative entities, from individuals to large organizations.

In short, this model (Figure 1) suggests a leadership approach that employs a systemic knowledge leadership as means toward achieving the end of satisfactory action and growth in each of the five elements as they apply to teams or organizations.
Mastering the five elements

The five elements are distinct, mutually dependent aspects of intentional processes within individuals, teams, and organizations that determine how they bring forth a new world by expressing their identity – individually or collectively. Together, they form a chain that connects the ultimate final ends of the creative process with the immediate means of their attainment. While this particular set of elements is consistent with and suggested by a number of contemporary intellectual threads, including philosophical pragmatism (Wiener, 1958), process philosophy, and autopoiesis, (Maturana and Varela) their correspondence to cultural archetypes facilitates their understanding and application. Activities in all five elements are equally critical in the process of shaping the future. In other words, the five elements are a dynamic system that when coherent and adapted to the situation at hand can support the highest levels of performance, and when misaligned can limit or hinder one’s growth and progress. We will define each of the elements and explain their respective roles within this system of relationships.

The first of the five elements is known as essence. This element is the most subtle of all the elements and corresponds to the individual, team, or organization’s core identity. Described variously over the ages by terms such as “soul” or “self,” the essence element also draws on the more modern concept of self-producing non-equilibrium systems, or unities, associated with autopoiesis. The simplest way to think of identity is as the defining property that influences how the system will interact with its environment in ways that differentiate from its environment. This property is what we might think of as the fundamental measuring stick by which all actions, are judged as satisfactory or not from the entity’s perspective. In organizations and teams, collective essence underlies the common values that unite its members in a sense of who we are. During the 1970s, IBM was the high value placed on service in the minds of its employees; in the 1980s, 3M the company was its unique appreciation for the process of innovation; and during the 1990s Toyota was its obsession for finding ways to increase customer value in its products.
The second element, air, correspond to mind and imagination. In air, the flight of imagination conceives of futures full of hopes and fears, distinguished by the values arising from essence. The imagined future is not, in the Platonic sense, some fixed ideal world that the turbulence of the real world wrecks our chance of attaining. Rather, as Dewey (1963) observed:

Change becomes significant of new possibilities and ends to be attained; it becomes prophetic of a better future . . . Since, changes are going on anyway, the great thing is to learn enough about them so that we may be able to lay hold of them and turn them in the direction of our desires.

In individuals, air takes form as aspirations for their personal future, whereas in organizations it is the shared vision that brings people together to realize a purpose that is greater than anyone could achieve singularly. Organizations and teams that are strong in the air elements are great at planning, analyzing, and envisioning new possibilities.

The third element is fire and it embodies the force of one’s will – to be on a mission. Whereas, the imagination in the air element flies unopposed and effortlessly, a mission necessarily requires effort to overcome opposition. According to James (1948): “The essential achievement of the will, in short, when it is most ‘voluntary’ is to attend to a difficult object and hold it fast before the mind.” Volitional fortitude – being fired up – is key to sustaining one’s effort until the mission is accomplished. Teams with a strong fire element are passionate about their mission and this passion provides the energy to drive them forward and sustain the effort in spite of resistance and setbacks. In organizations, fire is expressed through coordinated action and what is usually described as effective teamwork where energy and drive easily overcome obstacles in the way of getting the job done.

The fourth element is water and represents the flow of interactions belonging that are a normal part of social life. Virtues, such as loyalty, collegiality, camaraderie, and trust all flow from the water element. It is to be expected that in the social sphere there will be others, acting according to their own intentions, that are in some degree either supportive or resistant to one’s own mission. Through the water element, one seeks to understand and work effectively within this social force field to bring forth change. Without the positive feelings that evolve out of trust and shared experiences it is difficult to collaborate effectively. Through the water element, individuals and groups see that by interacting with others they can better achieve their mission than if they acted alone.

The final element is earth. Earth is the most visible, tangible, and practical of all the five elements. The earth element deals with the realities and limitations of the natural and social world. Laws governing such worldly features as gravity, time, and space, as well as capitalism, profit and loss provide a context that we operate within. In pursuit of a mission, individuals and groups create and modify structures that deal with these features, such as accounting systems, technology infrastructure, buildings and machinery.

When viewed as a whole, these elements present an integrated system for, as Senge put it, “shaping the future.” Because they are all critical to the overall system, the greatest capability for results is achieved when each element is sufficiently tended and integrated into the whole – in other words, the processes implementing the elements are in balance. On the other hand, systems that are unbalanced in their attention to these
processes often get stuck in ineffective patterns and have difficulty in recognizing how that got that way or how to get unstuck. For example, teams that have a dominance of the air element may create grand plans for the future, but if they lack sufficient focus in the fire and earth elements they will fail to have the energy and structure to follow through on these plans. The mounting confusion and malaise that emerge from these failures will dampen morale and hurt future efforts. In a similar manner, when companies are under financial pressure they often respond in knee-jerk manner by reorganizing or down-sizing (earth), yet if the new structures are not aligned with the essence or the vision (air) of the organization’s members, then the changes taking place within the system are likely to not be sustainable because they will be at odds with what the company is trying to become. A more detailed explanation of the potential ways in which these elements may interact, can be found in Seivert (2001) *The Balancing Act*. There is also an online survey instrument that has been used to assess the tendencies of leaders in terms of balancing the five elements. Although it may be evident how the five elements influence the capabilities of individuals, teams, and organizations, how do they relate specifically to project leadership? (Table I)

A summary of the five elements is presented below:

1. **Identity**. The quality that results in a strong cohesive organizational culture, clear brand identity, ethical business principles, calm productivity, and unifying values that guide daily behavior and decision-making.

2. **Vision**. The quality that is reflected in a clear, inspiring vision of the future, good humor, optimism, planning before action, examining of assumptions, and creativity that results in valuable new knowledge.

3. **Mission**. The quality that results in a strong commitment to an exciting shared mission, clear priorities, decisive action, high motivation and energy, and a willingness to quickly address and resolve conflict.

4. **Interactions**. The quality that is reflected in the workplace as caring community, good communication and information flow, high-employee satisfaction, ability to give feedback, a strong market and loyal clients.

5. **Structure**. Highly functional infrastructure built to realize organization’s identity, values, vision, mission, and optimize interactions. Strong bottom-line, careful resource management, high-quality products/services.

### Leading projects using five elements

Every management and leadership approach is based on series of beliefs and assumptions about how things work in practice, and what causes things to work best. The five elements approach to project leadership begins with one very simple, yet

<table>
<thead>
<tr>
<th>Elements</th>
<th>PM phase</th>
<th>PM functions</th>
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<tbody>
<tr>
<td>Essence/identity</td>
<td>Recognize need</td>
<td>Define purpose/values</td>
</tr>
<tr>
<td>Air/vision</td>
<td>Executive mgmt acceptence</td>
<td>Planning and analysis</td>
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<tr>
<td>Fire/mission</td>
<td>Line management acceptence</td>
<td>Motivation</td>
</tr>
<tr>
<td>Water/interactions</td>
<td>Growth</td>
<td>Staffing and team building</td>
</tr>
<tr>
<td>Earth/structure</td>
<td>Maturity</td>
<td>Structure and policies</td>
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Table I. Matrix of elements and project management functions
fundamental belief: when these elements of a system are in balance with each other, the capability to achieve desired results is maximized. While certain analytical approaches, such as system dynamics, offer tools and techniques for ascertaining the best ways to achieve balance among a system’s elements, these methods often require many years of study to master. Instead, we offer a leadership strategy for improving project performance that draws mainly upon a leader’s experience, knowledge, and intuition more than just tools and techniques. In starting, we make the assumptions that leaders are leaders know more than they can say. They can sense when things within a team are not working or out of balance. For example, in teams where there is an overabundance of force driving the air and fire elements but inattentiveness to the water and earth elements, projects will inevitably stall because important details that are necessary for implementation have been ignored. In a similar vein, in a company that is characterized by a lack of clarity in its essence, but teams are high in air and fire, but low in earth and water, teams are likely to veer off in a direction that may or may not be aligned with the company’s mission and then be unable to get unstuck because it’s leaders have no real vision of what its ideal future looks like. Getting and staying stuck in a low-leverage position often results from evolving patterns of thinking where people in an organization rely heavily on an elemental process to the exclusion of others. It then dominates and is insufficiently influenced by the other qualities to result in behavior that would be more supportive of the organization’s success.

As was noted earlier, the first step in leading dynamically complex projects is to recognize the system and the relations among its elements. Once these types of interdependencies are recognize, it then becomes possible to more clearly see how imbalances in one part of the system can produce undesired or unexpected compensating effects in other parts of the system. The authors were engaged as consultants to PRISM Sciences Corporation (PSC) for several years and made note of observations about how such imbalances and dynamics evolved over time in this company.

The case of PRISM Sciences Corporation
PSC is a medium-sized manufacturing company that specialized on manufacturing automated lens grinding machines for the optical industry. Their products were used by opticians throughout the world to grind lens for eye glasses to the desired optical strength prescribed by optometrists and ophthalmologists. PSC became successful by via the technological leadership of its scientists. They developed a steady stream of superior products and, by the 1980s, PSC became the acknowledged leader for high quality and state-of-the-art automated lens grinding machines. However, by the late 1980s, PSC’s market share began to decline as the result of an increasing number of smaller Japanese “clone” competitors reverse engineering their products and successfully marketing cheaper imitations. At this point, PSC began using an agile Research & Development strategy to create new products at a faster rate. The company goal was to enter and exit markets – with a profit – before the competitors could begin their cloning efforts. Their most recent state-of-the-art new product held the potential to radically change the industry – and render others virtually obsolete. Major funding was allocated to speed the completion of the development process. On the other hand, PSC’s manufacturing was done conventional and its focus was on producing high-quality products – even at the expense of higher productivity. Project teams at PSC were normally used for special short-term assignments to address narrowly-focused needs,
such as expediting customer orders, supporting new product releases at trade shows, and handling R&D spin-off products for emerging industries. Now, however, PSC’s president formed a new project team for the express purpose of producing the new next generation product in high volume. This was to be what they called a jet-propelled manufacturing process in contrast to the current propeller-driven system. The team began the process flow design, ordering new equipment, and MRP – to accommodate the new product that would soon be flowing through the pipeline.

Traditionally, PRISM’s structure had become defined mainly by the presence of information silos within the company and a high degree of dysfunctional competition among departments and teams. These groups typical focused on support and logistics functions, such as shipping, customer service, and vendor/supplier management.

The high rate of new product introductions had placed a strain on PRISM’s manufacturing center and its ability to deliver the new product prototype to the major trade show on time. R&D and engineering were moving at a faster pace that manufacturing and product support teams could accommodate. The new product was far more complex and these teams had not yet learned how to produce a product that was more complex than usual at a faster rate. The product support teams were accustomed to have longer lead times to prepare product user manuals and train call center employees for handling a simpler product. The complexity of the new product coupled with the pressure to get it out the door quickly to establish a competitive foothold in the market had set the stage for an unexpected series of problems within the company. Finally, the dynamics that had been spiraling out of control reached crisis proportions.

The vaunted new product, the next generation Opti-Spectrum II, was expected put an end to PSC’s declining pattern of sales and profits. The first problem reverberated through the company with a tsunami-like shockwave. The product demo models fell behind schedule and barely made it on time the major industry trade show – a first for PSC. In order to make it to the trade show on time, the product was not in its final version, and changes had to be made to the product after the show. However, in order to gain a jump on the manufacturing process, and shorten the order cycle time on parts for the new product, parts were pre-ordered by the manufacturing center. Once the product was returned to R&D for some last minute changes after the trade show, some of the pre-ordered parts being unnecessary and required they be disposed – while other new parts had to be placed on urgent rush order. Not only did the entire manufacturing schedule become delayed, but also the final cost of the Opti-Spectrum II was actually above the selling price promised to customers at the trade show. Rather than lose credibility with distributors, PSC sold the new product at the original promised price – that was 5 percent below their latest cost per unit. Although the Opti-Spectrum II was a hit with customers, but PSC also lost millions of dollars in profits the next year due to the problems with this product.

Where did the problems at PRISM begin and how did they spiral out of control? One useful explanation can be found in analyzing this situation by using the five elements. It can be argued that PRISM lost sight of its essence as it sought to become a different kind of agile company that could effectively fight off the advances of the clone competitors. Their new strategy of using agile R&D and manufacturing was driven by powerful air and fire elements, yet the company’s conventional manufacturing approach, structure based around silos, and hyper-competitive internal culture all
pointed to a system that was weak on the water and earth elements. Its leaders had lost track of the company’s identity and culture while its manufacturing center did not have the strength to effectively implement the new ambitious high-velocity strategies – especially in such as confused environment.

How could PSC have avoided the Opti-Spectrum II debacle and proceeded more smoothly in the direction of a more promising vision? While PRISM had successfully maintained a balanced system for many years prior to the threat posed by the clone manufacturers – they had done this by mechanistically operating in a relatively stable environment. The company culture, structure, planning, mission, vision, and identity were all in harmony prior to this point. They may not have been agile or high-performing, but they were able to leverage the company’s engineering expertise in developing advanced, high-quality products in a stable market for many years. When the shift took place to address the competitive threats, the project teams all started acting independently because they had no clear identity in the context of the company’s larger mission and vision, their structures were rigid and incapable of adequately responding to the competitive threat, and the culture of internal competition left the teams unprepared for the high levels of cooperation needed to effectively implement the Opti-Spectrum II project. There is no virtue in meeting project requirements if it also triggers imbalances throughout the rest of the organization.

**Project pragmatics and the five elements**

The PSC case demonstrates how imbalances in the five element of success can eventually lead to the poor results referred to throughout the paper. Now, let us consider what management practices and processes might exemplify a successful application of the approach we are advocating.

In review, we have argued that the challenges posed to real-world projects cannot be reasonably overcome by “hard” methods alone. Instead, in order to successfully act in a dynamically complex and uncertain project environment, the project team should be explicitly led to increased states of capacity for performance, adaptability, and learning. Through these states of increased capacity, the project will not only be more robust in the face of challenges, but will also more reliably create future value. The question at hand is, therefore, how project teams and leaders might bring about these enhanced states in their teams and organizations. Perhaps the most important point to be made is that these enhanced states have no final destinations; no satisfactory equilibrium to be achieved and maintained. Borrowing a well-known management term for a somewhat new purpose, the best that can be hoped for is continuous improvement. Whatever actions a leader might take under the guise of the proposed approach, it must be recognized that they logically are part of an ongoing process that is integral to doing business, not some special “effort” to be completed so that everyone can get back to business.

Particularly in organizations that have not been historically managed along these lines, instilling a high value placed on ongoing continuous improvement has proven to be one of the greatest leadership challenges. Regardless of how well supporting processes and practices are conceived, they will not be successful in the long run if they are consistently slighted or even abandoned when “more important” things come up – as they inevitably will.

Beyond this cultural foundation, the project leader must be sensitive to the relative needs facing the team at the present time. Throughout this paper, we have described
and provided examples of the challenges faced by project teams and organizations, as well as the strategies that can be used to address them. However, a particular team at a given moment will be faced with unique challenges and opportunities that will require marshalling and refocusing limited resources. Again, the objective is not perfection, but rather concrete reasonableness – contemplating options and choosing actions that will reliably do the most good based on sound reasoning.

Given these caveats, the next logical step is to use the five elements described previously to analyze one’s present situation and reflect on past experience. Each of these elements is a critical part of the total complex system that includes the project team and its environment. Assessing past and present capacity in each of these elements provides an effective overview of strengths and weaknesses that can be addressed over time.

Each element can be considered a complex dynamic system that can be managed according to the principles, strategies and practices generally described previously as components of project management system pragmatics, such as systems dynamics, knowledge management, and pragmatism. For instance, in the vision/air element, all the challenges and opportunities referred to previously – as well as the processes and practices for achieving concrete reasonableness – apply in the fullest sense. For example, pragmatism suggests that learning requires a process for comparing one’s expectations deduced from beliefs held at the time the action was planned to that which is actually experienced when the action is performed in order to confirm or revise such beliefs. In the vision/air element, this might involve comparing one’s experienced level of satisfaction with experienced parts of a projected vision based on beliefs about what would be satisfying if achieved in order to revise the vision going forward. Alternately, in the interactions/water element, the same pragmatic logic applies to beliefs about the intentions of others and how they relate to one’s own mission. Through actual interactions with others, one is able to test and improve beliefs about them within the interactions/water element, and use that knowledge to develop more effective partnerships and reduce non-productive interactions (i.e. actions within that same element).

The complex dynamic system related to each of the five elements includes not only the project team environment as a whole, but also the remaining elements that are related to it. For example, the desirability of a particular vision will be grounded in values obtained from the essence element, while a mission obtains it’s ultimate goal from a projected vision. This means that the learning and adaptation that occurs in each element relates not to just the external environment in which the project team must act in, but also the complex system that is itself in the various facets expressed by the five elements. Consequently, a revised belief in one element, say structure/earth (e.g. one work habit is more effective than another) might have a ripple effect through the other related elements (e.g. a mission plan is now believed to be more or less feasible, a partnership Interaction is now believed to be more or less useful, an essential value is now believed to be higher or lower than another, and so on) Therefore, the adaptive processes and practices in the project team must not only be responsive to actual experience, but also the thoughts and communications that arise from contemplating or acting in the context of any one of the other five elements.

The specific processes and practices that might be implemented to satisfy a project management system pragmatics approach are open to debate, selection and tailoring according to the circumstances, and the creativity of the project team and leader. However, regardless of how it is implemented, we have previously suggested that the
best results are obtained when the five elements are in balance. More specifically, we can now say balance in the context of team leadership refers to presence and effectiveness these processes and practices associated with element, and the energy and attention that are directed to them, relative to the needs of satisfactory team performance in its environment. Roughly speaking, each element is a link in a chain of thought and action between essence and earthly activity and concerns. This chain is strongest when the effort to maintain each link results in no weak links. The role of the project leader is to make that chain stronger every day.

Certainly, there are many lenses through which projects can be viewed, but there are clear advantages to seeing projects from a leadership perspective where broader considerations, such as systems thinking, learning, knowledge processing, and organizational dynamics all play key roles. The advantages of using Seivert's five elements model is its simplicity that enables leaders to use this framework immediately identify incongruities in any project that may be holding it back. More broadly, the challenge for the next generation of project leaders will be to develop the capacities of their team members for learning, knowledge-creation, and systems thinking about the project and the complex systems they operate within – all with a relative short time span.

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Further reading


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