Developing Resilience in Project Teams
A Path to Enabling Organizations for Thrivability

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ABSTRACT

This paper relates to an ongoing systems research conversation, "Enabling organizations for thrivability: New perspectives on form, structure, and process in favor of human and societal prosperity." It focuses on the question, "What could we possibly achieve if we co-create radical innovative patterns together, learning from other practitioners who are experienced in biology, technology, sociology, management, development, design, and ...?" Based on project team research viewed through a lens of complex adaptive systems and an adaptive model used in ecology, I will address "thrivability" in terms of collaboration, innovation, and learning. Specifically, my objective is to explore how project teams collaborate to co-create value as complex adaptive social systems in a multidisciplinary environment. In addition, innovation is explored as the impetus of creative destruction and its outcomes. Further, organizational resilience, specifically through development of adaptive capacity, is revealed as an outcome of learning through leveraging multidisciplinary experience.

When one "thrives", it means one is "to grow vigorously (flourish), to gain in wealth or possessions (prosper), and to progress toward or realize a goal (succeed). It may be understood as a step beyond sustaining, which implies nourishment, support, preservation, and maintenance. Organizationally, thriving can mean expanding resources, expertise, productivity, and profitability. Beyond maintaining an operational model, our organizational objective, in this discussion, is not to merely sustain but thrive. In other words, humanistic values are not only the baseline for ethical decision making, but inform how an organization operates in time and space (i.e. daily, locally, and globally).

When goals are not specifically defined, but are questions of "what could we possibly achieve," there is inherent risk in not knowing what to expect. A systems perspective can be valuable in defining systems boundaries - context, stakeholders, and impacts, through useful tools such as feedback. For example, the mission set out in the question of "what is possible" can be framed within a context of ethical and social responsibility, given the nature of the mission's objectives. Such an open-ended mission is challenging, especially to project managers, who often have an aversion to committing to amorphous goals, much less in terms of co-creation of radical innovative patterns across disciplines. As a former project manager, I take a practical approach to most issues with which I am confronted. As a result, my question is, "In practical terms, how can we achieve this mission?"

One reason this mission is challenging per se, is that the introduction of "radical" ideas provokes resistance in most organizations, especially those that are change adverse. It also requires dialogue across disciplines for exploration of models that may provide insight into issues that have not traditionally embraced concepts outside the confines of one discipline. This requires impartiality to a practical application of theoretical pluralism for the purposes of learning different approaches to problem solving. It also requires establishment of trust in the process of emergence of new ideas, concepts, and models of design, problem solving, and delivery.

Research exploring the dynamics of group development and ecological adaptation has shown that resilient organizations encourage development of adaptive capacity. Practically, adaptive capacity is operational flexibility that allows for risk taking, questioning standard operating processes, and learning from experience. The lessons learned are then incorporated into future projects and reorganization of resources. Project leadership plays an essential role in shifting

group norms and processes to promote adaptive capacity. Embracing change (incremental and transformational) and trust in the emergence of innovation are hallmarks of organizational resilience. Project teams that have developed adaptive capacity become leverage points as sources for organizational resilience and, subsequently, a path toward thrivability.

Keywords: Complex adaptive systems, group development, socio-ecological systems, theoretical pluralism, adaptive cycle, creative destruction, leadership, innovation.

INTRODUCTION

The purpose of this paper is to present share ideas about the development of project leadership competencies in the context of global sustainability and stewardship. This paper pertains to an ongoing systems research (EMCSR/IFSR/ISSS) conversation, "Enabling organizations for thrivability: New perspectives on form, structure, and process in favor of human and societal prosperity." It focuses on the question, "What could we possibly achieve if we co-create radical innovative patterns together, learning from other practitioners who are experienced in biology, technology, sociology, management, development, design, and ...?" This paper presents a discussion about specific themes that emerged from the results of a research study which investigated resilience in a project team (Edson, 2011). The discussion is set in a context of developing aspects of those themes, specifically project leadership and organizational culture, into competencies as a path to thrivability.

PROJECT TEAM RESEARCH

In 2011, I completed a research study of a project team exploring its development for evidence of resilience (Resilience Alliance, 2009) in the face of adversity (McMillen, 1999; Seery, Holman, & Silver, 2010). The study design used a systems research approach of theoretical pluralism (Midgley, 2011) through complex adaptive systems (CAS) theory (Miller & Page, 2007; Schneider & Somers, 2006) to explore the relationship between a group development model (Tuckman & Jensen, 1977) and an ecological adaptation model (Gunderson & Holling, 2002). Briefly, Tuckman and Jensen's (1977) phasic model included forming, storming, norming, and performing. Gunderson and Holling's (2002) dynamic model of ecological adaptation included exploitation, conservation, release, and reorganization. The project team was comprised of approximately 200 students and faculty at Cornell University (CUSD). CUSD was one of twenty academic teams that had entered into an international competition sponsored by the United States Energy (USDOE) to build a solar home as part of the department's consumer education program for energy efficiency, the Solar Decathlon (http://www.solardecathlon.gov/).

Through data analysis of 30 interviews (Kvale, 1996) with the CUSD's project team members and archival documents (Werner, 2009), a relationship between the two models was established using four principles of CAS theory. CAS are diverse, interconnected systems that exhibit self-organization (purposeful internal evolution), hierarchy (certainty created through structures that bring order and meaning), emergence (a coherent and integrated dynamic of innovation), and learning (planned application of experience to future events) in response to environmental feedback in light of uncertainty (Ahl & Allen, 1996; Ashby, 1962; Argyris, 1999; Bennett & Bennett, 2004; Corning, 2002; Gunderson & Holling, 2002; Goldstein, 1999; Holland, 1992, 1999; Kauffman 1993,1996; Lewes, 1875; Mintzberg & Westley, 1992). In addition to comparing and contrasting the models to understand the relationship between the models, the results were analyzed for evidence of creative destruction (Schumpeter, 1942; Sombart, 1913), in which innovation supplants established processes that no longer serve the goals and objectives of the project team. Creative destruction was evidence of a significant transformation resulting from a major shift in how CUSD

operated at a critical inflection point (Jarman & Land, 1992). Several nested cycles of adaptation through norm renegotiation occurred at multiple levels throughout the team.

Since the inception of the DOE's Solar Decathlon 2002, CUSD had built three different solar homes (2005, 2007, and 2009) and reorganized three times for each project, incorporating lessons learned from experience into the next iteration of their work. Over a two year period (2007-2009), CUSD constructed a unique, cylindrical, solar home and successfully competed in the DOE's 2009 Solar Decathlon. The results of the research study demonstrated that CUSD exhibited behaviors of Tuckman and Jensen's (1977) phasic model of group development -forming, storming, norming, performing, and adjourning. In addition, the project team manifested processes of Gunderson and Holling's (2002) model of ecological adaptation – exploitation, conservation, release, and reorganization.

After the 2009 Solar Decathlon concluded, CUSD adjourned, reflecting on its learning and reorganizing for its next project. This third reorganization resulted in a CUSD's adoption of an expanded agenda focused on sustainable design beyond the DOE's efficiency agenda for the Solar Decathlon. As a result, the team no longer competes in the Solar Decathlon, but it currently has three different, sustainable design projects in progress internationally (http://cusd.cornell.edu/silo).

Beyond establishing a relationship between the group development and ecological adaptation models, the research study's data analysis of CUSD revealed that resilience in a project team is largely dependent upon agency on its own behalf to sustain, adapt, and transcend itself in the face of uncertainty (Prigogine, 1997). In other words, a project team's success in achieving its goals and objectives depends on its *adaptive capacity*, the ability to consciously recognize the necessity of change, to consciously take behavioral and material action to change, and to embrace change through creative destruction, innovation, an integrative learning. CUSD's project team development is summarized using the two models and CAS theory in Figure 1.
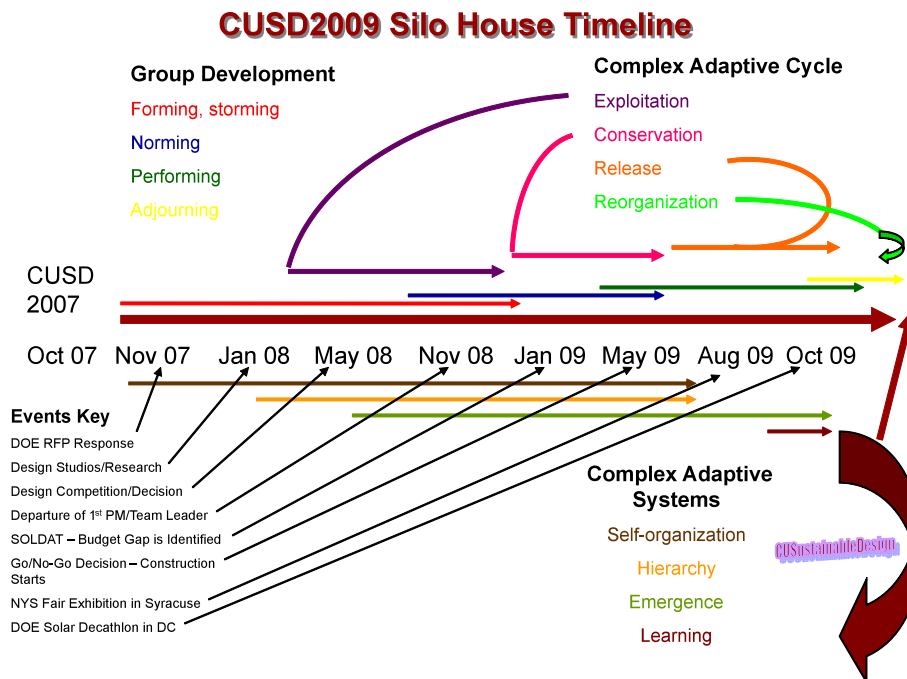

Figure 1. CUSD2009 timeline of group development and adaptation.

In addition, several themes emerged from the data analysis including CUSD's responses to organizational culture, inflection points in its development, nested adaptive cycles, leadership, and

innovation. While many of these themes are relevant to the topic for this discussion, "Enabling organizations for thrivability: New perspectives on form, structure, and process in favor of human and societal prosperity," the most salient themes of project leadership and organizational culture will be explored in depth. Relevance was established through the research study's correspondence to the topic in form (project teams and complex adaptive social systems), structure (group development, group dynamics, and group norms), and process (adaptation, construction and deconstruction hierarchies, emergence of innovation, and integration of learning). Further, project leadership may be leveraged to develop adaptive capacity and resilience as a pathway to thrivability through integrating understanding of the context in which a project team is operating (i.e. its organizational culture). As transformative leverage points, this discussion of project leadership and organizational culture is relevant to the theme given the larger context of global sustainability. Specifically, the context includes stakeholders with global imperatives including urgency around human survival and sustainability in a rapidly changing world environmentally, economically, and socially. Project leadership (an influential role beyond project management) is pivotal in the success or failure of a project team's success because it touches all its goals and objectives. The research study discussed in this paper is particularly relevant due to the nature of the team's project, which focused on addressing issues of sustainability and its implications in constructive ways on national and international levels.

DEFINITIONS

Since project leadership in service to project team resilience is the focus of this paper, this section substantially defines project management and leadership relative to organizational thrivability. Attention is given to the impact of organizational culture, distinct from anthropological culture (Hall, 1977), on these two approaches (management versus leadership) to conducting projects. The group development model (Tuckman & Jensen, 1977) and the ecological model of adaptation (Gunderson & Holling, 2002) were presented and their terms defined in two previous papers (Edson, 2011, 2010). Specifically, the terms used in both models - forming, storming, norming, performing, and adjourning; exploitation, conservation, release, and reorganization, were explored in depth. In addition, the four principles of CAS theory used understand the relationship between the two models (self-organization, hierarchy, emergence, and learning), as well as creative destruction were clearly defined in the context of the research. For a greater understanding of the concepts presented in this paper, readers are encouraged to refer to those two papers. For a better understanding of the how the study was designed, conducted, and analyzed, readers are encouraged to read the related dissertation (Edson, 2011) available through the ProQuest database.

In this discussion, I make a distinction between project management and project leadership. According to the Project Management Institute (PMI), a project is a temporary, planned activity with a unique goal that is temporary and time bound. Project management in organizations is a strategic activity that applies knowledge, skills, and techniques to efficiently and effectively execute projects. Project management is further defined as a discipline which involves organizing, planning, and managing the scope (goals, objectives, requirements, and constraints), resources (people, money - budget, material, and equipment), and time (allocations and deadlines) of a project. PMI states that it entails five processes including: 1.) initiating, 2.) planning, 3.) executing, 4.) monitoring and controlling, and 5.) closing. PMI (2012) emphasizes that many projects encompass large, technical initiatives across diverse disciplines and global geographies, and "all must be expertly managed to deliver the on-time, on-budget results, learning and integration that organizations need" (http://www.pmi.org/en/About-Us/About-Us-What-is-Project-Management.aspx, para. 5).

For the purpose of this discussion, project leadership is defined as a project manager's interpersonal skills to influence team members' performance to achieve the goals and objectives of the project. This definition is based on Chemers (1997) definition of leadership as, "the process of

social influence in which one person can enlist the aid and support of others in the accomplishment of a common task."

LEADERSHIP AND ORGANIZATIONAL CULTURE

Many interpretations of leadership exist including trait, attribute, charisma, situational and contingency interaction, function, behavior, and others (Robbins & Judge, 2007). Among these Lewin, Lipitt, and White's (1939) behavioral research about the influence of leadership styles and performance is tacitly understood and recognized in organizations. They investigated the performance of groups of eleven-year-old boys in different work environments. Each leader used his interpersonal influence in group decision making, managing group tasks, rewarding, and giving feedback. Three leadership styles were identified: 1.) authoritarian, 2.) democratic, and 3.) laissez-faire. While the research study of resilience in a project team was a retrospective case study focused on team members' behaviors during its group development, the leadership style of project leaders was a decisive factor in many of the conflicts and success of team.

Some researchers have questioned the extent of influence leaders actually have on organizational performance, suggesting that it is overvalued due to bias attributing leaders with power and control when other factors may have been causal (Meindl & Ehrlich, 1987). In contrast to these assertions, research supports the notion that leaders significantly contribute to organizational outcomes (Day & Lord, 1988; Kaiser, Hogan, & Craig, 2008). In particular, Kaiser et al. (1988) advocate for measurement of leaders' performance relative to their teams' and organizations' outcomes in lieu of individual managerial success. This discussion of the results of the research study of resilience in a project team focuses on project leadership from the team members' perspectives. Leadership emerged from the data analysis largely due to the project team members' reflections of how leadership at multiple levels impacted the outcomes of the team's success.

The study by Kaiser et al. (1988) also infers that leadership is contextual, meaning that it may be viewed systemically beyond attributes and situations. If this is true, then organizational culture influences the context in which leaders succeed or fail. The extent of leaders' successes may be due to their abilities to influence the operational culture in which the project is set. Organizational culture is defined as a system of shared meaning – beliefs, values, and actions that guides the members of an organization (Schermerhorn, Hunt, & Osborn, 2000). This definition includes external adaptation and internal integration as functions of organizational culture. External adaptation "involves reaching goals and dealing with outsiders. Issues concerned are tasks to be accomplished, methods used to achieve the goals, and methods of coping with success or failure" (p. 265). Internal adaptation "deals with the creation of a collective identity" and "finding ways of matching methods of working and living together" (p. 266). Robbins and Judge (2007) state that research suggests seven primary characteristics comprise the essence of organizational culture including: 1.) innovation and risk taking, 2.) attention to detail, 3.) outcome orientation, 4.) people orientation, 5.) team orientation, 6.) aggressiveness, and 7.) stability (pp. 573-574).

Schein (2004) explored the relationship between organizational culture and leadership. He provides a progressive recommendation for leaders in developing a learning culture, which he sees as imperative to organizational cultures that will thrive in a rapidly changing world. The leader of tomorrow will influence his or her organizational culture by modeling perpetual learning. Schein states that future leaders "will require: 1.) new levels of perception and insight into the realities of the world and into him- or herself, 2.) extraordinary levels of motivation to go through the inevitable pain of learning and change, especially in a world with looser boundaries in which one's own loyalties become more and more difficult to define, 3.) the emotional strength to manage one's own and others' anxiety as learning and change become more and more a way of life, 4.) new skills in analyzing and changing cultural assumptions, and 5.) the willingness and ability to involve others and elicit their participation" (p. 418). As Schein reflects that "learning and change cannot be imposed on people," he also reminds us that, "Ultimately, we cannot achieve cultural humility that is required to live in a turbulent culturally diverse world unless we can see cultural

assumptions in ourselves" (p. 418). Leaders, then, need to have self-insight to understand the current assumptions in their organizational cultures, the foresight into the future that will allow their organizations to thrive, and the skill to move their cultures in that direction.

PROJECT LEADERSHIP – RESEARCH RESULTS

In the CUSD study of resilience in project teams, the skills to facilitate change and adaptation are considered competencies for building adaptive capacity (Edson, 2011). The research study revealed that project leadership is influential on the outcomes of a project team to the extent that the leader can facilitate the renegotiation of team norms (Sherif, 1936) within the context of the team's vision and mission. As project leadership was revealed as a critical competency during the research, several questions surfaced about how it may be identified, learned, and leveraged. Other questions arose about project leadership's elusive qualities such as, "How does latent project leadership emerge?" "What conditions and characteristics are necessary for project leadership to emerge?" These questions are explored in the following section.

Emergence was defined at the beginning of the research study as a coherent and integrated dynamic of innovation. According to Bennett and Bennett (2004), self-organization entails complex systems "in which the agents have a high degree of freedom to organize themselves to better achieve their local objectives" (p. 290). In addition, they determine how objectives will be attained. In other words, the systems and project teams develop their own form of governance. Emergence, or emergent properties, is the concept that the whole is not merely the sum of its parts. Based on Ashby's (1962) thesis about the characteristics of emergence and self-organization, codes were developed to indicate in the data incidences where activities and actions of individuals culminated in outcomes that were greater than the sum of their parts. In this study, these definitions of emergence posed a conundrum in that the data were analyzed for evidence of collective emergence, not individual emergence and how that related to the team and its outcomes.

The research study's 30 interviews and subsequent data analysis revealed that leadership emerged on a group level, with the cohesion and commitment of a core leadership team of about twelve members, and on an individual level, with the manifestation of leadership qualities of one individual. With the emergence of one leader (PL1) who had the support of the core leadership team, the team's organization had defined its governance. The frequency of mention in the interviews about this individual's pivotal role in bringing the project to fruition could not be ignored, so I developed a code to track leadership in the data based on the descriptions in the interviews. This individual served as an organizational focal point for project management and team governance in terms of decision making, information sharing, resource management (Doppelt, 2003) for the project and the team at a peer level, as well as interacting with faculty advisors, an alumni advisory committee, university administration, alumni, and external stakeholders such as the DOE. PL1 had experience with the previous team, where he concentrated on being an apprentice of sorts, learning as much as he could about the project.

When the team reorganized after the 2007 competition, there was a consensus to reform as a democratic structure with a leadership board. PL1 rejoined the team as a key member interested in a leadership role, perhaps as an architecture team or subteam leader. At the end of the 2007 competition, a project manager had been named. During the ensuing months this project manager attempted to organize the team and its leadership board in a hierarchical way. After several months of conflicts, the project manager departed the team. Due to value conflicts about the project's vision/mission and the team's organizational structure, the team had spent months grappling with leadership issues in terms of command and control, authority, roles, and responsibilities. The leadership board endured a period in which it exhibited approach-avoidance behavior with most team members fearing to be perceived as grasping power. As a result, the leadership board developed groupthink (Janis, 1971, 1982) about power, authority, and leadership and avoided directing or delegating tasks which caused confusion. Little progress was made organizationally for approximately 15 months.

Meanwhile, PL1 was exhibiting organizational and operational competence to his peers. He became a subject matter expert on almost every aspect of the project. PL1's teammates recognized and respected his capabilities, as well as trusted his easy going style of communication. Gradually, the team and faculty advisors became increasingly reliant on him to inform them about the status of the project and what needed to be done next. By January 2009, he had stepped into the leadership void and emerged as the project team leader, even as he shunned the title.

From the research data, it became apparent that PL1 demonstrated several characteristics of servant leadership (Greenleaf, Spears, & Covey, 2002). Greenleaf, et al. defines servant leaders as "fully human" and "functionally superior because they are closer to the ground – they hear things, they see things, know things, and their intuitive insight is exceptional. Because of this, they are dependable and trusted" (p. 56). Team members pointed out that he did not allow his ego to take priority over the goals and objectives of the team and project. From the research data, the following passages show how the role of project team leader was recognized as a critical need and how PL1 emerged naturally to fill the void.

> I think everyone realized that there needed to be someone who was really in charge. The fact that nobody either felt qualified to do it or wasn't all that interested in it—I think PL1 wanted to run the architecture side of the thing, and ended up running much more than he expected. He just stepped into the role because he was the best person for it and he was an amazing manager. So, people just naturally pushed their decisions to him. So, I think that he was working as the leader of the whole team far before he realized it.

Another team member stated the following about PL1's team leadership:
> He filled that vacuum. There was like a vacuum and he kind of filled that vacuum. It definitely evolved. I think the idea was to have it much flatter and much more democratic. For some things it worked, but for some things it didn't work.

From the team members' perspectives, these incidents are evidence of emergent project leadership by PL1.

LESSONS FROM AN ECOLOGICAL MODEL OF ADAPTIVE MANAGEMENT

Such vivid descriptions of PL1's abilities by his teammates bring to mind a case study presented in *Panarchy: Understanding Transformations in Human and Natural Systems* (Gunderson & Holling, 2002). The case study was written by Frances Westley (2002) about "the adaptive manager as decision maker" (p. 352). Westley states that a key to adaptive decision making, as opposed to rational and traditional decision making, is "to strengthen the match between decisions and the demands of the decision making environment" (p. 352). She notes that in ecological systems there are at least four decision making environments including the ecosystem, the political system, the organizational system, and the interorganizational system. Westley details several issues of complexity in decision making. Westley cites a specific case of an environmental manager, Evan Karel, who successfully negotiated the complexity of his project and its stakeholders to become an adaptive manager. The lessons for adaptive managers that Westley derived from the case are summarized as follows:

• Adaptive management requires strong values as opposed to rational analysis. Karel grew up with a love of science and respect for people in equal parts.

• Adaptive management requires juggling multiple strategies and goals. Karel exhibited aptitudes for being a scientist collaborator, politician, and agency manager simultaneously.

• Adaptive management requires strong emotional self-discipline, little aversion to conflict, and great humility. Karel recognized when he was arrogant and how it backfired during attempts to coordinate agency and community interests. He acknowledged the essential role of building trust to foster cooperation.

• Adaptive management requires that the manager capitalize on the energy and movement of others, which entails a keen sensibility to recognizing opportunities for emergence and leveraging them. Karel was positioned to evaluate opportunities because of his involvement at the four decision making levels. He make efforts to be inclusive in his decision making process by involving disparate parties and interests. (pp. 352-354)

When I reviewed Westley's (2002) case study of Evan Karel, its similarity to the abilities that PL1 demonstrated during the 2009 solar decathlon project was remarkable. The following analysis outlines the parallels between PL1's project leadership and Westley's view of adaptive management:

• Adaptive management requires strong values as opposed to rationale analysis. As a carpenter working in Annapolis, MD, PL1 attended the DOE's Solar Decathlon in 2005. PL1 subsequently applied to the Art, Architecture, and Planning Program to specifically get involved with the solar house project. PL1 chose to enroll in Cornell's program because he had strong appreciation of architecture and great respect for the 2005 project team. He apprenticed during the 2007 project with the objective of learning as much as he could about project management and construction. Clearly, he wanted to be a part of a project and a community who shared his values about sustainable design and construction.

• Adaptive management requires juggling multiple strategies and goals. PL1 exhibited aptitudes for being an architect, collaborator, politician, and agency manager simultaneously through his competence in understanding the project at technical, interpersonal, and organizational levels.

• Adaptive management requires strong emotional self-discipline, little aversion to conflict, and great humility. From the comments made during the interviews, PL1 was humble about what he did not know, competent about what he did know, and magnanimous when dealing with peers and others. PL1 did not appear to relish conflict; however, he did not back away when the project's goals and objectives were in question. He elicited respect and trust at every level in the decision making process including team members, faculty, university administration, alumni, and the board of trustees. As a result, the project team had strong cohesion and commitment, as well as collaboration at multiple levels with seemingly divergent goals.

• Adaptive management requires that the manager capitalize on the energy and movement of others, which entails a keen sensibility to recognizing opportunities for emergence and leveraging them. PL1 positioned himself, first as an apprentice and then as a leader, to evaluate opportunities because of his involvement at the four decision making levels (team member, subteam leadership, leadership board, and trustee leadership). PL1's recruitment of essential talent at critical junctures in the project demonstrated his ability to identify project team's needs and exploit the necessary resources to get them filled. For example, PL1 enlisted MBAs to organize the business team and an architecture/sculpture student to design and fabricate the kitchen module.

PL1 attempted to be inclusive in his decision making process by honoring the democratic organizational structure and eliciting diverse opinions, especially from subteam leaders (Postmes, Spears, & Cihangir, 2001). As an adaptive manager who put the goals and objectives of the team before his individual, ego driven prerogatives, PL1 emerged as an example of servant leadership (Greenleaf, Spears, & Covey, 2002).

In summary, the correspondence between adaptive management and successful project management has several implications for project leadership. First, a strong project leader needs to share the goals, objectives, and vision for the project as the team and its stakeholders. Organizationally, this assumes that the project leader agrees with the means to the end (organizational structure, processes, and feedback), as well as the end product (goal). Second, a strong project leader ideally should have some experience at multiple levels of the project to understand how processes work and how much time is necessary to achieve desired results. From the data, it was clear that the project leader need not be an expert in every area, but understands the limits of personal knowledge. Understanding one's limitations, the successful project leader trusts and listens to team members to gather the necessary information for decision making. Third,

successful project leaders address conflicts directly, yet with diplomacy. Again, the underlying project leadership attributes of trust building and humility support resolution of conflicts by working toward a common vision and collaboration. Fourth, a successful project leader is able to recognize momentum and maintain it through the project's completion. A universal thread throughout these four aspects of project leadership is a humanistic value of respecting the people with whom you work and understanding that they want to achieve the common purpose to which they committed.

Some questions naturally become apparent such as, "Would these results be the same (repeatable) with a different project leader? How would it impact the adaptive cycle of the team's development? Was PL1 unique in his adaptive management capabilities or can these be recruited and/or learned? What does this mean in the course of this discussion of building global organizations for thrivability?

PROJECT LEADERSHIP AT THE INTERSECTION OF COMPLEXITY, RESILIENCE, AND THRIVABILITY

The framework of theoretical pluralism used to conduct this research study makes the results are particularly relevant to "Enabling organizations for thrivability: New perspectives on form, structure, and process in favor of human and societal prosperity" specifically in that it addresses the question, "What could we possibly achieve if we co-create radical innovative patterns together, learning from other practitioners who are experienced in biology, technology, sociology, management, development, design, and ...?" This study compared and contrasted two seemingly divergent models (i.e. group development and ecological adaptation) for the purposes of gaining insight into their processes for possible learning and application in project management and team resilience in the face of uncertainties.

The research provided partial answers through results indicative of possible project leadership competencies that may be cast in the context of global stewardship. Whether these competencies can be effectively identified during the selection process of project managers or inculcated during leadership training remains to be seen. However, education tends to heighten awareness, which can result in behavioral change and transformative learning at multiple levels (Mezirow, 1992; Taylor, 1994). While further study is merited, a sound systems research design requires discernment of the complexity of these competencies. Merely, identifying a project manager who holds commitment and experience may not be sufficient. Astute organizational leadership needs to read between the lines of a resume or interview. Indeed, the interview, in much the same regard as the research design, needs elicit more depth of response into the nature of a project manager's motivation for leading a team.

In this discussion, four competencies are discussed in CAS terms. First, as the research showed, PL1 exhibited strong affinity for the values of sustainability (McDonough & Braungart, 2002) expressed by the project of constructing a solar home and a democratically structured team. Second, he demonstrated an ability to successfully function at different levels and to multi-task without being an expert in any one area. Third, PL1 conducted himself with self-discipline and humility while negotiating through conflicts. Fourth, PL1 capitalized on the energy and movement of his project team. He used his keen sensibility to recognize opportunities and threats for emergence (Lichtenstein, 2000) of talents and resources. He leveraged strengths and weaknesses for the benefit of the team in achievement of its completion of the house and competition in the DOE's Solar Decathlon, despite the significant financial challenges the team faced. To gain more insight into how project managers may be identified and/or trained in these four competencies, it may be useful to view them in terms of principles of CAS in organizational practice.

PROJECT LEADERSHIP IN COMPLEX ADAPTIVE SYSTEMS

As defined earlier, CAS are diverse, interconnected systems that exhibit self-organization (purposeful internal evolution), hierarchy (certainty created through structures that bring order and

meaning), emergence (a coherent and integrated dynamic of innovation), and learning (planned application of experience to future events) based on environmental feedback in response to uncertainty (Ahl & Allen, 1996; Ashby, 1962; Argyris, 1999; Bennett & Bennett, 2004; Corning, 2002; Gunderson & Holling, 2002; Goldstein, 1999; Holland, 1992, 1999; Kauffman, 1993,1996: Lewes, 1875; Mintzberg & Westley, 1992).

Based on my literature review, I developed a conceptual framework about project team adaptation, creative destruction, and resilience. I sensed that the CUSD2009 Team experienced an urgent need for change upon discovery of a $60,000 shortfall that impacted its ability to compete in the DOE's Solar Decathlon in Washington, DC. This realization prompted rapid evaluation of the team's status and options. In order to meet the challenge, CUSD took action to alter how the team operated by setting aside norms that no longer supported the team's goals and objectives. Further, the team exhibited creative problem solving skills to address the gap between where the project stood and its goals. Team learning occurred when CUSD's established processes and norms were no longer practiced and new norms were implemented, a type of creative destruction (Schumpeter, 1942; Sombart, 1913), in which innovation supplants processes that no longer serve the goals and objectives of the project team.

CAS may be recognized by their ability to traverse ostensibly concomitant and conflicting forces. For example, creative destruction appears to be a paradox until we examine it closely. The cognitive ability to hold two seemingly contradictory concepts simultaneously may be an integral systems thinking capability that applies to all four of these project leadership competencies. The ability to make sense of unpredictable, unanticipated, and/or nonsensical events may be one of the essential competencies that project leaders need to demonstrate during the team selection process through behavioral interviewing. To maintain focus on the attainment of project goals, project leaders need to convey their teams a sense of order and certainty when the project lacks one or both. From the research, it was evident that a good project leader does not need to have all the answers, but knows where to find the resources to get questions answered. If one imagines a team as a web or matrix, the project leader provides a support structure of interconnections. If there is a role for a systems thinking in organizations, project leaders are in a poised position to apply it effectively. This positioning provides a leverage point for the application of systems thinking, resilience, and transformative change in organization, which furthers an objective of thrivability.

APPLICATION OF CAS PRINCIPLES IN PROJECT LEADERSHIP FOR THRIVABILITY IN A GLOBAL CONTEXT – THE CAT BA BIOSPHERE RESERVE

Integration of CAS principles, specifically self-organization, hierarchy, emergence, and learning, with the project leadership competencies revealed in the research study of team resilience may provide powerful leverage in projects focused on global sustainability and thrivability. For example, in this section, these factors are cast into a global context provided in a case study about managing the Cat Ba Biosphere Reserve (CBBR), Vietnam, in a paper by Nguyen, Graham, Ross, Maani, and Bosch (2012). This "what-if" exploration addresses the question of "What could we possibly achieve if we co-create radical innovative patterns together, learning from other practitioners who are experienced in biology, technology, sociology, management, development, design, and ...?"

Briefly, the purpose of the project, a pilot program described in Nguyen et.al (2012), was to educate a group of Vietnamese environmental and developmental professionals about sustainable management of a world biosphere reserve systems thinking approaches to transcend organizational and disciplinary divisions. The paper describes not only the transformative learning that took place during the project, but also the systemic approaches applied by the CBBR team to conduct the project, such as effective use of feedback to adapt the presentation of material (specifically, communication techniques internally and externally). Observing the CBBR team's development and its operation with this project through the lens of CAS principles and project leadership competencies proves instructive in revealing "what could we possibly achieve…"

Developing Resilience in Project Teams

The CBBR team was primarily composed of nine academic staff from the former School of Integrative Systems (SIS) at the University of Queensland, Australia. The CBBR team was cross-cultural, including a Vietnamese academic as essential support to the program leader. Like the CUSD project team, the CBBR project team consciously chose a democratic, "peer-to-peer" form. While Nguyen et.al (2012) focused on the delivery of education, the paper describes the high degree of interaction and feedback with the participants that prompted adaptation by the CBBR team to accommodate their requests. From the reflections expressed in the paper, the team can be observed as moving through phases of Tuckman and Jensen's (1977) group development model, as well as demonstrating CAS principles of self-organization, hierarchy, emergence, and learning at multiple levels. The extent of transformative learning is evidence not only at the conclusion of the program, but during a post program evaluation six months later.

Project leadership competencies demonstrated by the CBBR team are described as follows:

1. Adaptive management requires strong, humanistic values (Weisbord, 2004) as opposed to rational analysis. While rational analysis may have served as the foundation for the instructional design of the pilot program, the CBBR team commenced the program with a strong sense of humanistic values by involving the participants in critical decisions concerning content, delivery, and evaluation of the program from the beginning during self-organization (Nguyen et.al, 2012). Using learning adult principles outlined by Burns (1995, 2002), collaboration, cooperation, and self-reflection were inculcated into the program. Through application of these principles, the CBBR team adapted the program to suit the participants' needs such as communication skills for "managing up" and sharing information with local stakeholders.

2. Adaptive management requires juggling multiple strategies and goals within multiple levels of cultural contexts. The CBBR team applied multiple learning strategies to convey knowledge to participants through use of systems thinking models, as well as mind mapping (Buzan & Buzan, 1996), force field techniques (Carmen & Keith, 1994), focus groups (Krueger & Casey, 2000), and the fishbone technique of evaluation (Malouf, 2003). The delivery of education occurred at multiple levels of learning through auditory, visual, and kinesthetic methods (Markova, 1995; Markova & Holland, 2005). Since the goal of the program was to instill competencies to advance the sustainability initiatives of the CBBR, the experiential portions of the program were essential in securing participants' competency in rural community development and collaborative management using participatory methods and gender analysis tools. This was demonstrated by the observation made by Nguyen et.al (2012) that,

   > The mixed mode of delivery of the training programme (short courses,
   > meetings and field visits) was effective and successful. Participants learnt
   > the theories, concepts and techniques in the short courses, and then were
   > given a chance to see many of these applied in practice. The participants
   > have taken away many lessons and new knowledge, and many of them
   > have been successfully applied into their work.

   The effective use of hierarchy, organized teaching models and methods that fostered efficient knowledge transfer was evident from the CBBR team's outcomes.

3. Adaptive management requires strong emotional self-discipline, little aversion to conflict, and great humility. These characteristics are not easily observed in the paper by Nguyen et.al (2012) perhaps because of the inherent humility of the authors themselves or the nascent way these characteristics manifest. These characteristics are sometimes tacitly understood and emergent when necessary. What is evident in the paper is the extent of care put into the design, implementation, adaptation, and application of the pilot program. Personal knowledge of two of the leaders of this program allow me to extend that the project was led with judicious planning and attention to detail with responsiveness to participants' concerns. The degree of adaptation of the program required the ability to confront shortfalls and conflict in timely and effective ways. The CBBR team had to

overcome several obstacles, such as lack of integrated planning through critical reflection and evaluation. The regularly scheduled evaluations provided feedback that demonstrated self-discipline, low aversion to conflict, and humility to some extent by actively seeking out criticism that would improve the program in the short and long-term.

4. Adaptive management requires that leaders capitalize on the energy and movement of others, which entails a keen sensibility to recognizing opportunities for emergence and leveraging them. The pilot program instituted by Nguyen et.al (2012) has capitalized on the energy and movement of the initial group of environmental and development professionals by mobilizing advocates for their program throughout Vietnam. This is shown by the authors' reflections that the project has "started to 'snowball'":

While education and learning were the main objectives of the CBBR pilot program, it can be observed that learning was occurring at multiple levels and dimensions, as this excerpt states,

> In addition, the value of this programme for participants representing different levels of governance could go some distance in removing barriers of communication and information flows and improve decision making processes. It has also developed a common understanding of the issues created – a shared vision and commitment for action. Because the participants hold relevant and important positions directly related to the management of the CBBR, the involvement of power and leadership, as suggested by Vemuri (2009), will be of significant importance for the seamless continuation of the CBBR project.

The multi-disciplinary and systemic approach helped participants co-create value for themselves and one another, as well as to become more resilient in their own roles as environmental and development professionals. The multi-dimensional approach served to strengthen rather than fragment the effectiveness of the program.

The "what-if" question may be projected to look like the outcomes achieved by the CBBR pilot program. "What could we possibly achieve if we co-create radical innovative patterns together, learning from other practitioners who are experienced in biology, technology, sociology, management, development, design, and ...?" Based on project team research viewed through a lens of CAS and an adaptive model used in ecology, the CUSD research study and the CBBR case study addressed "thrivability" in terms of collaboration, innovation, and learning. Specifically, both cases explored how project teams collaborate to co-create value as complex adaptive social systems in a multidisciplinary environment (Jehn, Northcraft, & Neale, 1999; Page, 2007). Organizational resilience, specifically through development of adaptive capacity, was revealed as an outcome of learning through leveraging multidisciplinary experience.

SUMMARY AND CONCLUSIONS

In summary, four key project leadership competencies derived from the research, in terms of successful global thrivability, appear to be as follows:

1. Adaptive management requires strong, humanistic values as opposed to rational analysis. The process of self-organization is not a straight-line progression, but a dynamic one with elements of forming, storming, and norming. Humanistic values provide a basis of human respect that team members appreciate as they proceed through the group development process working towards common goals and objectives.

2. Adaptive management requires juggling multiple strategies and goals within multiple levels of cultural contexts. This may be understood to mean "have a plan but do not cling to it." Organizational structures, like training methods and budgets, provide artifacts of common meaning mutual understanding.

3. Adaptive management requires strong emotional self-discipline, little aversion to conflict, and great humility.

4. Adaptive management requires that leaders capitalize on the energy and movement of others, which entails a keen sensibility to recognizing opportunities for emergence and leveraging them.

The project leadership competencies that were revealed in the course of analyzing the CUSD research data were some of several variables that contributed to the success of university's team. In addition, the team exhibited high levels of commitment to its goals despite the adversities it encountered. Team members had vested interests in seeing the project to its successful completion in immediate terms of graduating from the university, as well as longer term benefits in gaining applicable "real life" experience in their chosen fields.

Given the context of the data, there was no doubt that the support of faculty members helped team members see the larger implications of their actions and inactions. Indeed, the wisdom and discernment exercised by the lead faculty mentors in choosing when to step in and offer advice and when to let the team learn from its mistakes was critical in the ongoing learning process and evolution of the team. As a result, CUSD demonstrated a higher tolerance for risk taking is part of the calculus for project success than most commercial enterprises (Wallach, Kogan & Bem, 1962; Paton, 2003). However, calculated risk taking by enterprises supports innovation, as can be seen in technological successes to capture a latent demand for products such as Apple's iPod, IPhone, and IPad.

In concert, the faculty, the project leader, and the team responded to adversity by adapting their norms of communicating and operating in response to feedback within the scope of the project, and to some extent, external stakeholders' demands that impacted the financial foundation of the project. This was evidence that the team was building adaptive capacity through norm renegotiation (McMillen, 1999; Seery, Holman, & Silver, 2010). While the timing of the team's response was adequate to complete the house and competition, a question remains whether the team should have paid attention earlier to stakeholders who clearly had influence over the outcome of their efforts. This is an important lesson for groups to recognize at the organizational level, as well as at the global level. Specifically, is the project team scanning the environment for additional influences that may impact the team's outcomes. A lesson from the CBBR pilot was to involve stakeholders early and often, eliciting periodic evaluations for feedback and adaptation. This may take the form of a periodic SWOT analysis, to check that the team's goals remain relevant and in alignment with the objectives of the larger vision and purpose for the project. This strategy builds adaptive capacity that promotes project team and organizational resilience. From a systems perspective, this outcome suggests that project teams and their leaders should function contextually as open systems rather than closed by soliciting feedback from relevant stakeholders and their operating environments.

While the CUSD project was conducted at an American university, the team was multi-cultural as well as multi-disciplinary. As a population, university students are in a learning frame of mind and are encouraged to challenge their world-views. The attitude of openness in this environment sensitizes students to understanding differences and finding similarities. At an interpersonal communication level, this is a competency that is desirable on a global scale as well. The CBBR team actively recognized the need for cultural understanding by retaining a Vietnamese academic in a leadership role from the beginning of the pilot. Cross-cultural sensibilities may not have been necessary for CUSD, but for CBBR and project like it, they are critical to the success and thrivability of such endeavors. Adaptation that considers cultural context, norms, and consequences of change is apt to be adopted. Organizational change is difficult because of systemic interdependencies with embedded hierarchies. In other words, organizational culture can become embedded and intractable resulting in resistance by the actors. This phenomenon can be observed in artifacts, processes, and behaviors that become implicitly accepted and inculcated into daily operations. This is evidence of Bertalanffy's (1969) principle of "progressive mechanization," in which hierarchy in an organization creates specialization in the pursuit of efficiency (p. 213). Yet, an organization becomes inflexible because hierarchy assumes stability in the environment (p. 213). As Farson (1996) puts it, "this presents us with the paralyzing absurdity that the situations we

try hardest to avoid in our organizations would actually be the most beneficial for them" (p. 126). As a result, the inclination to address uncertainty with increased control is counterproductive. If future change is to occur in organizations, it will likely come through resilient teams that have requisite variety (Ashby, 1962) and adaptive capacity. Diversity in terms of multiple disciplines and cultural points of view can potentially strengthen an organization rather than disrupt it (Seery, Holman & Silver, 2010). Project leaders who have cross-cultural sensibilities can leverage team strengths and mitigate weaknesses by consciously addressing value differences (Jehn, Northcraft & Neale, 1999).

In conclusion, project management can play an essential role in "enabling organizations for thrivability" through at least four project leadership competencies teams working towards global thrivability. Three recommended approaches that may be effective in bringing these competencies into organizations are: 1.) implementing selection processes that elicit interviewee demonstration of these four competencies for project management positions, 2.) participative education and training in these competencies, and 3.) cross-cultural and project team coaching that develops the organizational bench strength in these competencies. Further, senior organizational leadership is encouraged to evaluate its positions concerning risk tolerance and the extent of its expectations concerning organizational culture and conformity to norms. Finally, to combat organizational tendencies towards "group-think," senior leaders might consider evaluating the effectiveness of organizational feedback methods from internal and external stakeholders (Janis, 1971, 1982). Groups at all levels tend to become insular. Project team leaders are wise to confirm the relevance of the organizational goals and objectives in the context in which the outcomes will operate.

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Developing Resilience in Project Teams

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