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Unlocking a Project Team's High-Performance Potential
by R. Archibald, I. Di Filippo,
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Unlocking a Project Team's High-Performance Potential
Using Cognitive Readiness:
A Research Study Report and Call to Action

Russell D. Archibald[1]
Ivano Di Filippo[2]
Daniele Di Filippo[3]
Shane C. Archibald[4]

Executive Summary

High-Performance Teams (**HPTs**) is a concept within organization development referring to teams and organizations that are highly focused on their goals and that achieve superior business results. High-performance teams outperform other similar teams and gained popular acceptance in the US by the 1980s, with adoption by many organizations. (Katzenback 2003.) However, without understanding the underlying dynamics that created them, and without adequate time and resources to develop them, most of these attempts failed. With this failure, HPTs fell out of general favor by 1995, and the term *high-performance* began to be used in a promotional context, rather than a performance-based one. (Hanlan 2004.)

> "Although there are many teams achieving more than 50 percent improvements in a single success dimension in less than a year, the critical difference in High Performance Teams is that *they make orders of magnitude improvements in all four dimensions simultaneously*," Hanlan says, referring to manufacturing and service teams (Hanlan 2004.)

Within the past 10 to 15 years some private sector and government sector organizations have placed new focus on HPTs, as new studies and understandings have identified the key processes and team dynamics necessary to create all-around quantum performance improvements. (Katzenbach et al 2000.) With these new tools, organizations such as Kraft Foods, General Electric, Exelon, and the US government have focused new attention on high-performance teams. This effort relating to teams falls within a broader movement of developing high-performance organizations, as discussed by Andre de Waal in "Characteristics of High Performance Organizations."

Cognitive Readiness in Project Teams: The important concept of Cognitive Readiness in project teams is presented in this report and discussed as a new element to be considered in managing projects, with the objective of achieving greater project success through high team performance. Projects only become alive and real when people are assigned to the project team, starting with the project manager, and projects exist within a field of project stakeholders. Of course, the project manager and the other project team members are themselves internal project stakeholders, together with the several other types of external project stakeholders, as discussed below. Thus, human behavior within and across

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[1] Chairman Emeritus, Archibald Associates
[2] In charge of human resources in the Operations Center of Radiotaxi 3570 Roma, Italy,
[3] IT/Engineering Graduate Student at Roma3 University, in Rome, Italy; Member ISIPM.
[4] Managing Principal, Archibald Associates.

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these two groups (project teams and stakeholders) directly affects every project throughout its life cycle. Applying the knowledge of human behavior provided to us by the advances in cognitive psychology enables project managers to build high-performance teams through perception, observation, appraisal, measurement, management, and improvement of project team members' and stakeholders' behavior, leading to greater project success. The need for high-performance, cognitive-ready teams is greater for innovative and transformative projects and programs than for commercial, delivery projects, although both of these types can benefit substantially when high performance of their teams is achieved.

Basic Cognitive Concepts: The basic concepts of cognitive psychology and Cognitive Readiness for project teams are presented, including both Cognitive Constraints and Enablers. Definitions of these are conveyed through well-known examples from widely accepted psychology precepts. We introduce an outline of a method to obtain the best in agency, commitment and other "cognitive" factors from the project team, thus obtaining maximum project success through high performance of the team. The use of this method spans the entire Comprehensive Project Life Cycle[5]. Consequences of this new approach are:

- Introduction of Cognitive Readiness as a new key element in project management team building and performance metrics: 1) scope, 2) time, 3) cost, 4) quality, 5) risk, 6) benefits, and 7) Cognitive Readiness of the project team.
- Introduction of the cognitively qualified project manager as a new soft skill for project managers.

We forecast that the cognitively qualified project manager will become a new focus of maturity in project management.

A Note about Projects, Programs, and Portfolios: We focus in this report primarily on projects, but the concepts apply equally well to programs (or programmes for some) and portfolios of projects and programs, since executive teams (often titled "Portfolio Steering Committee") usually hold responsibility for prioritizing and authorizing projects and programs.

The Objective of this Report is to create a greater awareness and understanding throughout the global project, program, and portfolio management communities of the importance of, and potential benefits from, applying cognitive psychology advances to project teams. We believe the approach described here will produce high-performance project teams and substantial benefits derived from greater project success and delivery of greater business value. Much work remains to be accomplished to translate the approach we describe here into procedures and methods ready to be applied in the field.

Structure of the report: This report consists of these nine sections:

1. **Introduction:** Linking cognitive psychology with project management.
2. **Cognitive Readiness and High-Performance Project Teams:** What cognitive readiness is and why it helps to create high-performance project teams.

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[5] See Archibald and Di Filippo, 2012 "The Six-Phase Comprehensive Project Life Cycle Model Including the Project Incubation/Feasibility Phase and the Post-Project Evaluation Phase."

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3. **Appraising and Developing the Cognitive Readiness of Individuals and Project Teams:** How to apply this concept on a practical basis.
4. **Cognitive Constraints and Cognitive Enablers:** What these are and how they are used.
5. **Delivering Business Value:** The benefits of cognitive readiness in project teams.
6. **The Dimensions for Determining Project Success:** How team cognitive readiness adds to the traditional measures of project success.
7. **Enhance the Team, Enhance Yourself: Be "Cognitive"!** Put these ideas into practice to develop your soft skills.
8. **Conclusions:** The main inferences and deductions that can be drawn from the information presented are contained in nine conclusions.
9. **Call to Action:** An appeal is presented to practitioners, professional and industry associations, governmental agencies, and universities to initiate actions to apply, investigate and further develop the concepts of cognitive readiness in project, program, and portfolio teams.

Genesis of this report: The authors became acquainted early in 2012 via the Internet through an Istituto Italiano di Project Management/ISIPM LinkedIn discussion group. After an initial on-line exchange of ideas, this multi-generational, multi-cultural quartet decided to collaborate to produce first a paper and secondly this report. Russell, age 89, an American who has lived in 6 countries and consulted in 16 countries on 5 continents, brings a perspective formed by 65 years in engineering, executive, program and project management across several industries. Ivano, age 53, an Italian, brings a perspective formed by 20 years in IT and as a consultant and project manager in business information systems development, and he has for 25 years been in charge of human resources in the Operations Center of the largest Radiotaxi company in Italy and Europe, in addition to his university student years in the medical field; Daniele, age 23, also Italian and the son of Ivano, has of course grown up in the Digital Age, has a strong interest in human behavior, and completed his university degree in IT engineering in July 2012; Shane, age 43, an American and a grandson of Russell, adds in-depth knowledge gained in managing diverse projects and consulting in project controls for 20 years in the USA and elsewhere. This unique multi-generational combination of authors has produced a team effort that has created the perspectives and proposals presented in this report. This four person project team began developing its cognitive readiness on-line and during several face-to-face sessions over a three day period in Rome in March 2013. Short CVs of each of the authors follow the References.

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[6] These 18 reviewers bring perspectives from several disciplines and 7 national cultures (Brazil, Canada, Colombia, Italy, Poland, UK, and USA.)

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1. Introduction

Although the human side of project management has been acknowledged since that management discipline began to be recognized as distinct from other management disciplines during and after World War II, it is only in recent years that the cognitive science of human behavior is being accepted as an important element in measuring and achieving success in project management.

The various project management standards refer to a number of processes for managing people in projects, including allocating them as resources, ways of leading them, communicating, resolving conflicts, and building teamwork among them. However, little attention has been paid to the **human behavior** aspects of people in project management. The field of cognitive psychology coupled with cognitive neuroscience (see side bar) now enables us to apply this knowledge of human thinking and behavior in practical ways to continually improve the "soft" or people skills of project and program managers, their team members, and their project and program stakeholders.

Cognition, noun: 1. The mental process of knowing, including aspects such as awareness, perception, reasoning, and judgment. 2. That which comes to be known, as through perception, reasoning, or intuition; knowledge.[7]

Brief Definition of a High-Performance Team: A high-performance team can be defined as a group of people with specific roles and complementary talents and skills, aligned with and committed to a common purpose, who consistently show high levels of collaboration and innovation, and who produce superior results. The high-performance team is regarded as tight-knit and focused on their goals. Team members are so devoted to their purpose that they will do all that is humanly possible to surmount any barrier to achieve the team's goals.

Within a high-performance team, people are highly skilled and are able to interchange their roles within realistic limits. Also, leadership within the team is not dependent on a single individual. Instead the leadership role may be taken up by various team members, according to the need at that moment in time, and again within realistic limits of scope and authority. High-performance teams have robust methods of resolving conflict efficiently, so that conflict does not become a roadblock to achieving the team's goals. There is a sense of clear focus and intense energy within a high-performance team. Collectively, the team has its own consciousness, indicating shared norms and values within the team. The team feels a strong sense of

Cognitive psychology is a sub-discipline of psychology exploring internal mental processes. It is the study of how people perceive, remember, think, speak, and solve problems.

Cognitive psychology differs from previous psychological approaches in two key ways.
- It accepts the use of the scientific method.
- It explicitly acknowledges the existence of internal mental states (such as belief, desire, idea, knowledge and motivation).

In its early years, critics held that the empiricism of cognitive psychology was incompatible with its acceptance of internal mental states. However, the sibling field of cognitive neuroscience has provided evidence of physiological brain states that directly correlate with mental states - thus providing support for the central assumption of cognitive psychology. **Cognitive neuroscience** is an academic field concerned with the scientific study of biological substrates underlying cognition with a specific focus on the neural substrates of mental processes. It addresses the questions of how psychological/cognitive functions are produced by the brain.

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[7] **The American Heritage Dictionary of the English Language** (4th ed, 2000): see also "Cognition," Maria A. Brandimonte et al, 2006.

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accountability for achieving their goals. Team members display high levels of mutual trust towards each other.

The concepts presented in this report should lead to significant improvements in the human interactions within project teams, which in turn usually will produce greater project success. Improved interactions between the project managers and other team members, who are actually internal project stakeholders, with their external project stakeholders will lead to greater project value, which includes both the direct business benefits of the project plus those intangible values such as stakeholder satisfaction, gratitude, and general good-will.

> *"The evidence of a vast array of research concerning teamwork is conclusive: teams are capable of outstanding performance and are the primary unit of performance for increasing numbers of organizations. Nevertheless, high performance teams (HPTs) are a rarity.* (P. Castka et al, 2004.)

2. Cognitive Readiness and High-Performance Project Teams

2.1 Cognitive Readiness is an indicator of how well the project team will perform during the planning and execution of the project. The authors of this report coined the term "cognitive readiness" during this report's early drafts. However, our research soon indicated that, while the term is not widely known, it has been used and developed beginning over a decade ago in military training and team development research funded by the USA Department of Defense's Defense Advanced Research Projects Agency (DARPA) and by other researchers. Among the several existing definitions of Cognitive Readiness we consider John E. Morrison and J. D. Fletcher's (2002, p. I-3) definition to be the most valuable one:

> *"Cognitive readiness is the mental preparation (including skills, knowledge, abilities, motivations, and personal dispositions) an individual needs to establish and sustain competent performance in the complex and unpredictable environment of modern military operations."*

Greg Balestrero: "What is left out of this definition are the tools and their application that allows them to exercise their cognitive abilities…[we also need] to develop the environmental radar (such as through scenario thinking) to see emergence of challenges and opportunities. I believe that there is individual cognitive ability, including that of the team leader, and then a group cognitive ability…different and unique, each demanding attention and in some cases coaching …."

We further define Cognitive Readiness as a cognitive capability to adapt to and quickly address with manageable stress new, unpredictable, unforeseen changes, acting dynamically and proactively with self-efficacy sensations. Through Cognitive Appraisal and Development (see Section 3 below) the team acquires the competence of self-cognitive and stress resilience enhancement in a sequential and non-linear manner. How quickly the team can adapt to new, unpredictable situations can be measured by Cognitive Appraisal methods. A person who is cognitively ready demonstrates as a core capability a high degree of **adaptive** expertise (in addition to their normal routine expertise) in the dynamic, complex, and changeable environments of a project. He is proactive in the management of the tasks assigned to him, is empathetic to the problems of the other team members, has a positive attitude, is strongly focused on the goals of the project, and enjoys his work.

This applies equally well to business, industrial, governmental, and other kinds of operations, including of course projects and programs. In fact, some authorities have pointed out that almost every military

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operation is really a project or a program. As noted in Balestrero's adjacent comment, this definition does not include a list of tools to appraise and develop cognitive readiness. Some of these tools are available but many remain to be developed.

So it is worth focusing on the importance of reaching a first level of cognitive readiness accomplished during the Project Incubation Phase that enables the project manager to develop the team to be increasingly tuned to each other's ways of operating. If this is accomplished then the project will enter the Start Phase with a very high margin of safety. As the project proceeds through the Start and subsequent project phases we will be able to increase this Cognitive Readiness to its maximum level. There is no doubt that all the project team members have to work together on their project and respond to its changing requirements and conditions adaptively and coherently. We recall the historical facts of "The Battle of Thermopylae**"** where a very small team of soldiers (in respect to the Persian troops) fighting coherently were able to face and defeat thousands of soldiers of the Persian army.

As shown in Figure 1, the project manager and the other team members are not only 'knowledge and expertise ready' but also 'cognitively ready.' These teams will demonstrate a facility in adaptively reacting and making decisions, and possess the flexibility needed to effectively respond to failures, threats, scope creeps, change requests and unpredictable situations. A team that is cognitively ready has the ability to address every new situation while performing at a high success level, regardless of the stress level involved.

> **Murray Woolf:** **"**….certain project delivery models (especially ones that are contractually restrictive) discourage and even ban improvisational responses to changing conditions. Needed, then, is for project owners and other influential external stakeholders to address this formidable barrier to the adoption of Cognitive Readiness."

Team members must have the appropriate project management knowledge and the technical expertise required by their individual roles, plus the cognitive capabilities that the four step process of developing the team's cognitive readiness, described later in Section 3, will produce. This double competency will enable the team to achieve the high performance needed to be successful in the face of unexpected changes. In leading and managing a project the project manager must also have this double competency.

> **Murray Woolf:** "This concept, in order to work, will require a greater quality and different type of Project Information. Currently, Project Controls data are chiefly retrospective. Greater emphasis is needed on studying the road ahead, and less on recounting the road already traveled."
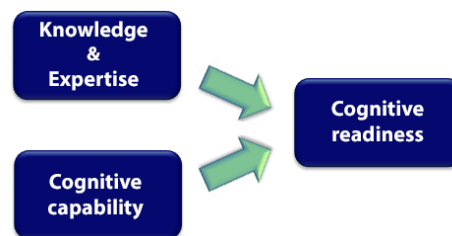
**Figure 1. Cognitive Readiness requires knowledge and expertise in project management
and specific technical areas plus cognitive capability.**

Research and development about cognitive readiness is being carried forward not only in Defense activities but also in several other branches of human activities such as teaching institutes and numerous industries:

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"*Teaching and Measuring Cognitive Readiness presents theoretical and empirical findings regarding cognitive readiness and assessments of their impact on adult learning. The term readiness is used in assessing student preparation for K-12 schools, while in the military and in industry, "readiness" denotes preparation to be effective in performing a mission or a job.*" (O'Neil et al, 2013.)

2.2 The Impact of Cognitive Readiness on Project Teams: Many project teams achieve high performance levels after working together with an effective project manager for a fairly long period of time. Focused effort, as described in this report, to create cognitive readiness within the team during the team forming and later phases may have a substantial and positive impact in accelerating and unlocking this high performance of the team. This depends on both the project manager and also on the project team members themselves.

Existing project management standards emphasize the importance of effective teamwork on project success:

- **Developing good teamwork is a primary responsibility of every project manager:**
  - "*Project managers should acquire skills to identify, build, maintain, motivate, lead, and inspire project teams to achieve high team performance and to meet the project's objectives. Teamwork is a critical factor for project success, and developing effective project teams is one of the primary responsibilities of the project manager.*" (PMI 2013, p. 274.)
  - "*Applying interpersonal skills provides the opportunity to create high-performing teams, build individual effectiveness, develop confidence and drive success.*" (APM 2012, p. 30.);
  - *At IPMA Level A Certification: "The candidate has to have shown effective application of the behavioural competence elements in the coordination of projects and/or programmes, within the scope of a portfolio or a programme, and alignment to the permanent organisation and in relation to the strategy of his organisation. The candidate has guided (sub) programme and/or project managers in their behavioural development. The candidate has also been involved in implementing the behavioural competence elements or methodology in projects or programmes and contributed to the development of the project manager's profession by publishing or presenting his experiences or new concepts regarding the behavioural competence elements.*" (IPMA 2006, p. 84.)

> **Murray Woolf:** To pick up on my earlier comment, needed are *two* major improvements to the current PM model that go hand-in-hand.
> One is project information that is forward-looking. Current PM ideology advocates a retrospective view of Project Management. The "plan your work and work your plan" model manifests in multiple Project Control Systems that focus on comparing *past* planned performance with *past* actual performance.
> Far less emphasis is placed on what lies ahead. In fact, attempts by the Project Team to react to changing future conditions are often met with criticism or punishment (for example: working "out of sequence.")
> The other improvement over the current PM model is the one to which this paper speaks. Even if better, more forward-looking information is made available (through better Project Information), the Project Team must be of a different mindset to receive it. Cognitive Readiness goes hand-in-hand with Prospective Project Information.

- **Stakeholders' value perceptions and high-performing teams:**
  - "*The project manager should manage the influences of these stakeholders in relation to the project requirements to ensure a successful outcome.*" (PMI 2013, p. 30.)

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o *"Stakeholder management is the systematic identification, analysis, planning and implementation of actions designed to engage with stakeholders."* (APM 2012, p. 116.)
o *"The project manager should identify all the interested parties, what their interests are, and sequence both in order of importance to the project."* (IPMA 2006, p. 40.)

- **Performance appraisal of team members is required:**
  o *"Objectives for conducting performance appraisal during the course of a project can include clarification of roles and responsabilities, constructive feedback to team members, discovery of unknown or unresolved issues, development of individual training plans, and the establishment of specific goals for future time periods."* (PMI 2013, p. 282.)

All project team members hold responsibilities for excellent collaboration and high performance: Although these standards indicate that the project manager has the primary responsibility to develop effective collaboration in his or her team, some of them fail to mention the responsibilities of all project team members in building a high performing team.

> *"Outstanding teamwork demands that every member of the team be a good follower, a good leader, and a good collaborator within their areas of responsibility and with due regard for the total project. The concept of project followership encompasses all of these attributes."* (Sampietro and Villa, 2014, Foreword by Russell Archibald.)

Project team members must be cognitively ready and also be good followers:

> *"The technical and specialist contribution considers the team member as a point of reference for a particular subject area (knowledge of a product, experience in a specific technology, familiarity with a particular customer environment, mastery of a complex regulatory framework). The managerial contribution instead refers to a set of project management actions for which the expert's contribution is crucial. For instance, think of schedule/cost estimates on certain project activities, the identification of the main project risks, the analysis of variances during the work progress review, the handling of change requests to the initial plan, and capitalizing on the experiences gained from the project.*

> *"According to this perspective, the project team member interacts with the project manager and the other members of the team even on managerial aspects, sharing assessments, proposals and actions that help to strengthen the project management system.*

> *"We propose to define the managerial contribution of the project team members "project followership". Project followership means 'proactive participation in all managerial aspects of the project work within an individual's visibility horizon.*

> *"The term 'followership' does not have negative connotations (Boccialetti 1995, Chaleff 1995, Kelley 1992) and should not be seen as disparaging for the following reasons:*

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- *a follower's role in supporting the achievement of objectives should not be read as 'facilitating the careers of others', instead it means supporting the group in achieving higher levels of performance, which have a positive impact on all;*
- *being a good follower does not mean being inferior to the leader; a leader without good collaborators could not be a good leader and, vice versa, collaborators without a good leader to coordinate them would have less chance of success, less space to express themselves, fewer career opportunities and fewer opportunities to engage in motivating activities;*
- *in our working lives we all play both leader and follower roles; so we should not associate these labels with power but rather conduct that is appropriate in some situations and less so in others." (Sampietro and Villa, 2014.)*

In addition to the standard approach to appraising the performance of a potential or actual team member quoted earlier on page 7, we need to also appraise their "cognitive skills." For example, when a team colleague responds angrily to your request to revise a design drawing for the project you are both working on, how do you react? With matching anger, or do you think about what the reasons might be that made him angry and then attempt to defuse his anger with a valid explanation? This appraisal of cognitive skills is discussed in more detail below in Section 3 of this report. This is part of the process of developing self-awareness in the individual team member and in the team as a whole. The team's cognitive skill styles are appraised on a cognitive dashboard (see Section 3.3 below), identifying the strengths, the potential weaknesses, synergies and possible conflicts that might be created within the team. This appraisal is conducted at appropriate intervals over time together with team developmental activities to enhance the cognitive readiness of the project team. There is a need for expert coaching assistance in conducting this cognitive appraisal at both the individual and the team level, as indicated in the adjacent quotation from Balestrero.

Greg Balestrero: "My experience shows that each team member, including the PM, possesses cognitive abilities of one sort or another. The team also possesses a group cognitive ability… but it may be vastly different from the individuals. Traditional standards view the PM as the one who "controls and manages" the abilities of the others. In fact, the group creates a cognitive culture, based on the contributions of all individual stakeholders. In EI [Emotional Intelligence], for example, consultative approaches first measure the individual EI capacity, and then through a bench assessment, can develop a group EI capacity...each requires a degree of coaching to build toward a group capacity. And, the PM in this case has a significant influence on the cognitive ability…he or she is a great influencer to the ability and may very well be the cause for failure, particularly if they think their capacity is the capacity of the group."

The project manager will play a significant role in this appraisal but an expert Cognitive Coach will probably be required to assure the best results at least during the first application of this project management cognitive innovation approach in a specific organization.

We are hopeful that in response to this present report practitioners will apply these concepts to real projects and achieve the benefits that we predict, as discussed later in Section 9, and that project management professional associations will include these cognitive concepts in their standards and certification procedures.

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2.3 Cognitive Readiness is required:

> **"**As Steve Jobs once said, 'Creativity is having enough dots to connect.' Experts focus deeply on one dot, making it difficult to look at your business with fresh eyes."[8]

Experts are great at finding incremental improvements that build on past successes. However, project teams face completely new challenges each and every day. Best practices serve well in industry standards, but we also need 'next practices' to show where improvements are being made. 'Cognitive Readiness' based on mental capabilities that enable us to view solutions from a different perspective can be considered a 'next practice' that will lead to future best practices regarding team-building, in our opinion.

> **Becky Winston: "**We need best practices as well as next practices in some areas. Not all areas of the practice of project management are evolving at the same rate, so best practices are what we need.

In forming and developing a high-performance team it is crucial to appraise the cognitive capabilities of each potential member by identifying and measuring them. Cognitive Readiness is an indicator (but not necessarily the only one) of how well the project team will perform during the planning and execution of the project. A team's cognitive abilities can sense environmental uncertainties and impending changes that, coupled with scenario planning and methods such as Lichtenberg's Successive Principle approach[9], can provide powerful help when dealing with a project that involves great uncertainty.

> **Greg Balestrero: "**To some extent, I believe you are broadening cognitive abilities into more than being sensitive to human performance in stakeholders…I believe you are hitting on something quite powerful. Cognitive abilities sense changes in the environment, dynamic changes that can affect the performance of a project…like an environmental radar. Your statement implies the need to be able to manage in uncertainty…which is the ideal ability.

2.4 Project Teams and Effective Team-Working are an Essential Core Concept in Project Management:
While there is an abundance of literature on teams, most of the project management literature and

research activity focuses on roles and responsibilities, especially those of the project manager, and on procedures and systems for project planning, estimating, evaluating and controlling. However, developing high performance project teams has not received the attention that it deserves, in view of the fact that project teams are a core concept of project management as shown in the following quotations:

> "The three key differentiating characteristics of project management when compared to on-going functional operations management are:

> **Murray Woolf:** "Trust is absolutely essential to effective project management that is proactively oriented. This may explain why construction projects suffer such a pathetic track record. Their contracts are immersed in distrust, and dominant Project Management theory further poisons the operating environment with an inherently distrusting belief system. As one example, Critical Chain Project Management is justified in large part on Parkinson's Law. Equally, the overbearing presence of Project Controls is a further concession that parties are not to be trusted to self-manage and self-regulate for the betterment of the Whole."

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[8] Stephen Shapiro at **The European Business Review**, 2013.
[9] See Lichtenberg 2000 and Archibald 2003, pp. 239-240.

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1. Assignment of **integrative responsibilities** for projects and programs at several levels[10],
2. Application of **integrated project planning and control information systems**, and
3. Execution of the work required for each project by **integrated teams of people** using available, assigned resources." (Russell and Shane Archibald 2013, p. 10.)

"A primary responsibility of each assigned project and program manager is to build a cohesive team that is comprised of the multi-disciplined functional managers and specialists (project team leaders), plus the project controls specialists, needed to plan, schedule, estimate, execute, and manage each project and program." (Ibid, p.15.)

2.5 Definition of a High-Performance Project Team: Expanding our earlier brief definition of a high-performance project team on page 4, these project teams work well together and enjoy doing so. They produce positive energy that is conveyed to stakeholders. They trust each other and produce superior results in the shortest possible time. The high-performance team is tight-knit, intensely focused on their goals and highly motivated. Within the high-performance team, people are highly skilled and they are aware of their roles in the team and are able to interchange them in helping each other (within practical limits). They easily communicate because they are "tuned" to each other's frequency. They are cohesively focused on a common goal, do not blame each other, are proactive and adaptive in a responsive manner, reliable as individuals and as a whole, share a sense of pride in the task they do, listen and help each other, spend time as
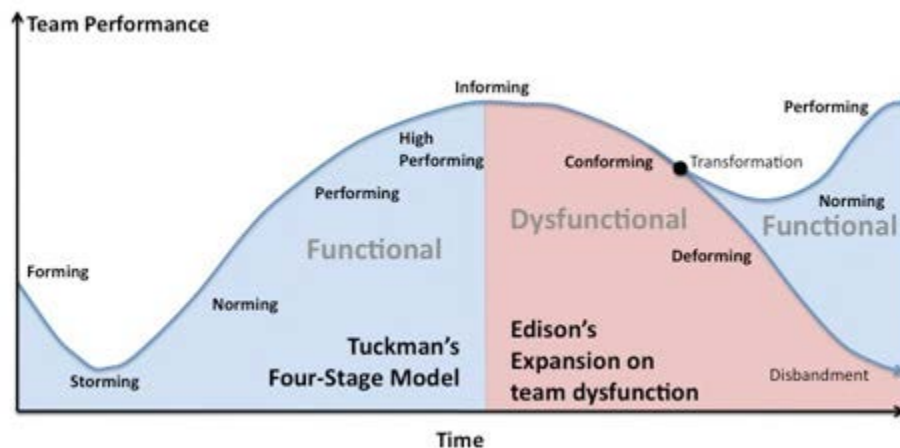
> **Bob Prieto:** As new members join the team and requirements and conditions change, "the team as a minimum must be aware of new insights and periodically … have their existing paradigm challenged so the team does not suffer from **cognitive lock** and drive off the cliff. Cognitive lock occurs when we hold on to a course of action against all contradictory evidence."

friends celebrating achievements reached, and they are proud to belong to the team. For a review of the various definitions of high performance teams see Castka et al 2004.

Such a team lets you accelerate the way you innovate. The project incubation and start phases represent a time when it is desirable to make evaluations in choosing and forming the high performing team and focusing on the stakeholders' value perceptions as well. After *Forming* the team, according to the Tuckman model (PMI 2013, p. 276.), during the course of a project you can continue to benefit from and keep improving the team's cognitive readiness during the subsequent phases: *Storming*, *Norming*, and *Performing*. The final *Adjourning* team phase provides the opportunity to record both the individual

> **Murray Woolf:** "In the Cognitive Project Management model there is an early meeting of the emerging Project Team, called the Project Facilitation Summit. At this Summit, the Project Owner is guided in the selection of Project Team members with a trained eye on universal compatibility across core values. This approach is completely consistent with the advice given in this paragraph."

and team cognitive abilities for reference when the project team is formed for the next project. For a discussion of "cognitive lock" mentioned in the adjacent quotation by Prieto, click here. Figure 2 (next page) presents Edison's (2008) representation of the stages of team development that adds "team dysfunction" to the Tuckman model as a possible phase for some teams. In the source paper he describes the causes of team dysfunction.

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[10] These levels are: 1) CEO, 2)Project/Program Portfolio Steering Group, 3) Project Executive Sponsors, 4) Managers of the Project Management function within PMOs (Project Management Offices), 5) Project and Program Managers, and 6) Functional Managers and Functional Project Team Leaders.

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Figure 2. Project Team Performance Curve. (Source: Edison 2008, p. 15.)

2.6 Stakeholders' value perceptions and high-performing teams: Current PM standards emphasize the need to identify and "manage" the internal and external project stakeholders:

- **"***The project manager should manage the influences of these stakeholders in relation to the project requirements to ensure a successful outcome."* (PMI 2013, p. 30.)
- "*A detailed analysis should be made of stakeholders and of the impacts they might have on the project, so that the project manager can take maximum advantage of their contribution to the project. From this process, prioritized stakeholder management plans may be developed."* (ISO 21500 2011 p. 18.)
- *"The project manager should identify all the interested parties, what their interests are, and sequence both in order of importance to the project. Taking this competence element into account will improve the chances of a successful project. The project is constrained by its context and may be adjusted to meet the interested parties' needs. Their expectations also need to be managed.*" (IPMA 2006, p. 42.)
- *"Programmes will have business change managers, who will be responsible for influencing the many stakeholders who need to actively embrace change in order to achieve the required benefits.*" (APM 2012, p. 66.)

Project stakeholders include both internal (the internal project owner, executive sponsor, project manager, other members of the project team) and external to the project (buyer of the project, regulators, governmetal agencies, NGOs, people affected by the project and its results or product.) The project manager cannot be expected to manage these influences single-handedly, since many project team members have direct contact with external project stakeholders. We add to this the importance of all team members' awareness of every project stakeholders' value perceptions.

All Key Performance Indicators related to the important stakeholders should be identified and considered during the project incubation and start phases. In particular the stakeholders' project value perceptions should be identified to determine if they could represent or be interpreted as either a Cognitive Constraint or a Cognitive Enabler (see Section 4 below). This is an area that is frequently not well developed, especially for transformational projects.

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2.7 Recognition of the Power and Importance of Cognitive Readiness in a Team:

> *"Over the past decade, the scientific research community has endeavored to optimize human performance in complex domains through a better understanding of the cognitive, behavioral, and attitudinal aspects of cognitive readiness, at both the individual and team level. Cognitive readiness is:*
>   - *'applicable to any dynamic domain in which individuals and teams must perform increasingly complex tasks under conditions of uncertainty, time pressure, and high consequences for error;*
>   - *a multi-dimensional construct that is formed and maintained when personnel interact with other team members within their operational environment and, thus,*
>   - *involves a broad range of cognitive, behavioral, and attitudinal factors'* (Bolstad et al, 2008)

> *"Consequently, determining if personnel are cognitively ready to perform their jobs poses a considerable challenge to organizations in both the private and public sectors"* (Cuevas and Schmorrow, p. 433, 2012.)

This "considerable challenge" is being attacked on a number of fronts within several private and public sectors. The United States' Department of Defense has recognized the power and importance of a team's cognitive readiness, as indicated by its numerous research and training investments and activities over the past decade. One example of this research is the

> **Greg Balestrero** "Cognitive abilities of the team, I believe, require interaction to have the abilities to manifest themselves in quick, responsive, agile decision making. More and more teams are in virtual space."

article (Bolstad et al 2006) from which Figures 3 and 4 (see page 14 below) were taken. An additional challenge is to develop the cognitive readiness of *virtual* teams. Whether or not the appraisal and development of the cognitive aspects of virtual project teams can be achieved using audio/video communications across cultural, political, and language boundaries remains to be proven or disproven.

It is obvious that cognitive training for mortal combat, fire-fighting, or other hazardous situations has a life-or-death motivation and urgency that is not present in most business or government projects. However, the lessons learned from warfighter training can certainly be applied to important projects. In fact, the prosperity or death of corporations and government agencies frequently depend on the success of important projects, as shown by the development and introduction of the computer mouse by Apple (Gladwell 2011.) One can only speculate about the existence today of the Apple Corporation if Compac Computer Corporation (and not Apple) had developed and introduced the computer mouse 34 years ago.

2.8 Team Cognitive Readiness is More Important in Innovative, Transformative Projects and Programs than in Commercial or Delivery Projects and Programs:

> "All significant innovations are achieved through Projects." (Russell and Shane Archibald 2013, p. 9.) However, "not all projects are innovations…. It is necessary and useful to recognize the differences between:

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- **Major, strategic transformative projects** that are intended to change or transform the enterprise significantly and thereby achieve its strategic vision, mission and objectives, and

- **Routine "delivery", "commercial", "deployment", "process, service, or product improvement", or "compliance" projects** that generate income and profit, reduce cost, otherwise improve the services or products provided to the enterprise's customers or constituents, or comply with laws and regulations,

> **Greg Balestrero:** "I think too that the transformative projects provide a more tangible connection to the strategy of the organization. Their 'strategic value' is more prevalent and provides 'purpose' to the group. Routine projects may lack incentive or motivation since they seem to be distant from the strategic direction of the organization. Also, such strategic projects might warrant a facilitator or coach in cognitive behavior to help the team along."

within the enterprise's established strategic vision and objectives, without creating significant changes within the enterprise itself." (Ibid, p. 18.)

However, it should be noted that in many cases these more routine delivery projects form vital segments of larger transformative projects for the owner, buyer, or client organization. If done poorly they can have damaging impact on those related transformative projects.

Innovative, transformative projects involve many uncertainties, unknowns, and rapidly changing environmental conditions, hence the teams for these projects require much stronger cognitive readiness and cognitive consonance to achieve the high performance that will produce the desired transformative project success. While it is also very desirable for delivery project teams to achieve high performance, the probabilities of these projects encountering similar uncertainties and changing conditions are smaller, since most of these projects are repetitious of, or similar to, many previous projects that the enterprise has executed. Therefore we believe that an enterprise will first want to apply the approach described in this report to their important transformation and innovative projects, and then apply the lessons learned to their delivery projects. On the other hand, there is a sound argument for applying the cognitive readiness approach as a pilot project application on a less risky, well-known type of project to test the principles within a known environment.

3. Appraising and Developing the Cognitive Readiness of Individuals, Project Teams, and Project Stakeholders

Project Management Standards Recognize the Importance of the Soft Skills for Project Managers and all Project Team Members:

> "*Interpersonal skills, sometimes known as 'soft skills,' are behavioral competencies that include proficiencies such as communication skills, emotional intelligence, conflict resolution, negotiation, influence, team building, and group facilitation. These soft skills are valuable assets when developing the project team. For example, the project management team can use emotional intelligence to reduce tension and increase cooperation by identifying, assessing, and controlling the sentiments of project team members, anticipating their actions, acknowledging their concerns, and following up on their issues.*" (PMI 2013, p. 275.)

> "*Success or failure of a project may depend on how well the various project team members and stakeholders communicate with each other,*" as stated in ISO 2012, p. 30).

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> *"Interpersonal skills are the means by which people relate to, and interact with, other people…. Projects, programmes and portfolios are delivered by people. The dynamics, attitudes and relationships between these people are the key enablers to P3 [project, programme, and portfolio] success. Applying interpersonal skills provides the opportunity to create high-performing teams, build individual effectiveness, develop confidence and drive success." (APM 2012, p. 50.)*

However, "interpersonal skills" are only one of a number of components involved in the cognitive readiness concept. These individual skills become blended with the other cognitive components to produce first the cognitive readiness of individual team members, including those of the project manager, and subsequently of the project team as a whole. The nature of team cognitive readiness and how to appraise and develop it is discussed below.
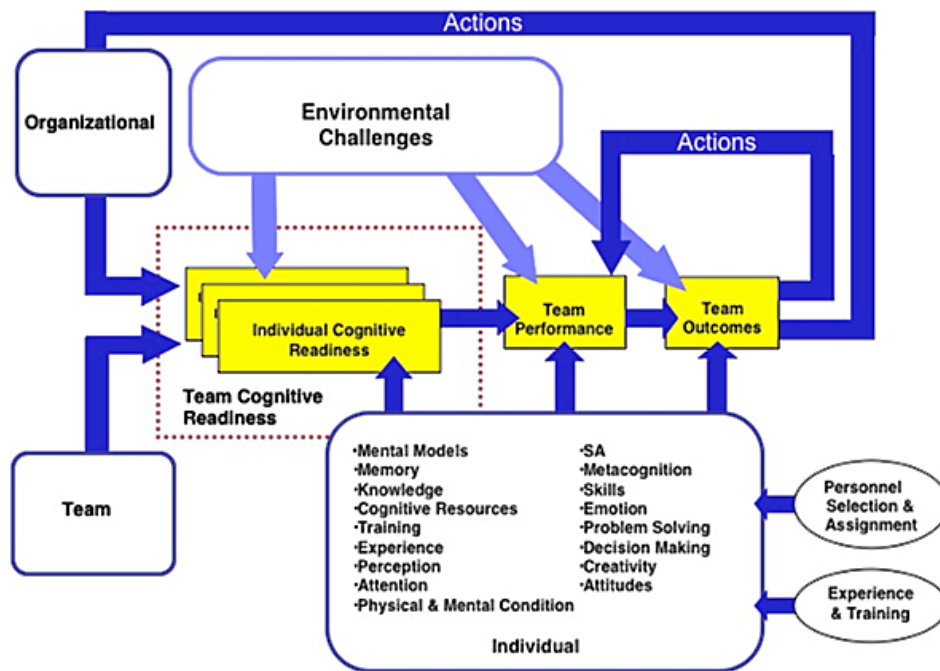
Fundamental Aspects of Cognitive Readiness: Figure 3 (below) presents a basic view (according to one group of authors) of the several human characteristics that influence cognitive readiness of an individual person and of a team of individuals, including some of the important environmental and organizational factors and characteristics. Figure 4 presents a conceptual model by those same authors showing how a team's actions and its results interact with the individuals to create and change the team cognitive readiness. The careful reader will note that there are

> **Bob Prieto**: "Let me suggest that the environmental list of factors [in Figure 4] is much broader. For example Fukishima changed the German psyche with respect to nuclear power."
>
> **Greg Balestrero:** "Both Figures 3 and 4 seem to imply that the environmental factors are internal to the team or the organization. Fatigue, stress, etc., are purely individual phenomena. However, the external environment may very well be a major factor affecting the success of the project."
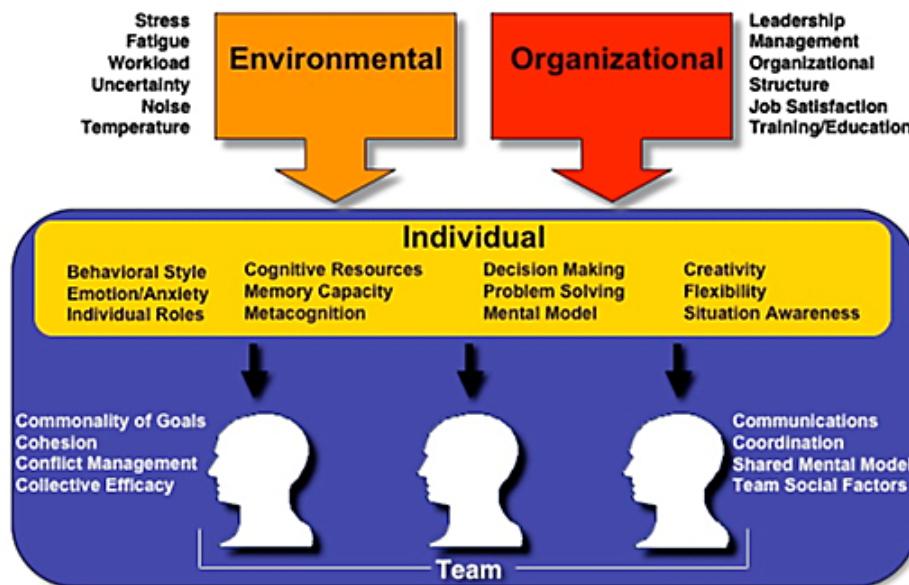
Figure 3: Individual, team, organizational, and environmental characteristics influencing an individuals' cognitive readiness.
Source: Bolstad el al, "Predicting Cognitive Readiness of Military Health Teams," *International Ergonomics Association 16th World Congress, Maastricht, Netherland*, 2006.

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Figure 4: Conceptual model illustrating how characteristics influence cognitive readiness.

Source: Bolstad el al, "Predicting Cognitive Readiness of Military Health Teams," *International Ergonomics Association 16th World Congress, Maastricht, Netherland*, 2006. Note: "SA" means Situation Awareness.

some differences between these two figures even though they come from the same set of authors. In response to the adjacent comments, yes, the environmental challenges shown in Figures 3 and 4 must be expanded to include many external factors as well for most projects. Projects and their teams are often affected by local, regional, and even global factors, well beyond the immediate environment of the team itself. A listing of the attributes of that have been

> **Greg Balestrero: "**I believe the power of this is to promote environmental radar concepts… [when you achieve] that cognitive ability to sense environmental changes, react, and build the human response without a significant increase in stress, or a loss of stakeholder value, then you are definitely on to something."

already systematized in the literature by several other authors is shown in Table 1 (Grier et al 2012.) Note that the important component of emotional intelligence is not specifically identified by any of these authors in Figures 3, 4, or Table 1.

Table 1

Component Constructs of Cognitive Readiness and Their Measurement

Constructs	Morrison & Fletcher	Fletcher & Wind	Grier
Metacognition	X	Y	Y
Creativity	X	Y	Y
Adaptability	X	Y	Y
Resilience/ hardiness		Y	Y
Critical thinking		Y	Y
Decision making	X	N	N
Problem solving	X	Y	
Situation awareness	X	Y	
Pattern recognition (memory)	X	N	
Automaticity	X		S
Transfer	X		
Leadership	X		
Emotion	X		
Communication		Y	
Teamwork		N	
Interpersonal skills		N	
Intelligence			Y
Motivation			Y
Personality			Y
Sensemaking			Y
Tacit knowledge			N
General knowledge/ technological competency			N
Military knowledge			S
Deployment area knowledge			S

X – included construct but measures not evaluated
Y – measures evaluated and considered reliable and valid
N – measures evaluated but not considered reliable or valid
S – measures will be context specific
Note: Bolded items were identified by Grier as components of strategic cognitive readiness.

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We present below a conceptual outline of the steps that need to be taken to achieve these high team performance goals within the project management context. These four steps are:

1. Define the Cognitive Readiness Appraisal Criteria.
2. Familiarize Affected Project Managers and Team Members with the Concepts of Cognitive Readiness to Create the Appropriate Level of Cognitive Awareness.
3. Conduct the Cognitive Appraisals of Individual Team Members and of the Team as a Whole.
4. Monitor and Develop the Project Team's Cognitive Readiness,

Each of these steps is described in the following sections.

3.1. Define the Cognitive Readiness Appraisal Criteria: From the characteristics and attributes listed in Figures 3 and 4 and Table 1 we must select and prioritize those items that are judged to be the most important for the situation at hand, namely the category or nature of the project and its environment.

These criteria may vary significantly for different types and categories of projects[11] in different regional, national, and global locations. For example, the key cognitive factors for a project team will not be exactly the same for the teams responsible for these very different programs and projects:

- Transformational program to merge two large financial banks having global operations.
- Program to design, construct, and start up a petrochemical plant with supporting residential and transportation facilities in Nigeria by an international consortium with an Italian company in the lead.
- Project using Agile methods to develop and implement a complex information system for a national government within the European Union.
- Transformational program to design, construct, and hand over an underground rail transportation system within a major city in the USA.
- Project to design and launch an improved financial service by a bank in France.

The cultural, economic, technological, and political environments in these few examples will also have significant differences that will affect the selection of the cognitive factors for these teams.

To expand the reader's understanding of some of these important cognitive mental abilities, we present here descriptions of those that we believe will most often be involved in appraising the cognitive readiness for most project teams. The following abilities include some that are listed in Figures 3 and 4, some shown in Table 1, and some that the present authors have identified within other published sources, as cited in each case.

- **Leadership** is the ability to influence people in order to elicit their support to achieve certain goals. Leadership can be defined as mastery and systematic use of capacity, that many possess but few use, which allow leading a group of people who may be ordinary towards achieving excellent goals. The profound difference between the "head" and the "leader" can be effectively summarized in this way: the chief makes people do things; the leader convinces people to do things. The use of authority is typical of the chief, while authoritativeness is typical of the leader!

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[11] See Russell and Shane Archibald 2013, pp. 29-36.

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*"**Leadership** involves providing direction and motivating others in their role or task to fulfill the project's objectives. It is a vital competence for a project manager."* (IPMA 2006, p. 86.);

*"The project management team is a subset of the project team and is responsible for the project management and **leadership** activities. This group can also be referred to as the core, executive, or leadership team"* (PMI 2013, p. 255.)

*"**Leadership** involves focusing the efforts of a group of people toward a common goal and enabling them to work as a team. In general terms, leadership is the ability to get things done through others. Respect and trust, rather than fear and submission, are the key elements of effective leadership. Although important throughout all project phases, effective leadership is critical during the beginning phases of a project when the emphasis is on communicating the vision and motivating and inspiring project participants to achieve high performance."* (PMI 2013, p. 512.)

*"**Leadership** is the ability to establish vision and direction, to influence and align other towards a common purpose, and to empower and inspire people to achieve success."* (APM 2012, p. 68.)

- **Emotional Intelligence**: Emotional intelligence (EI) is the ability to perceive, assess, understand and control the emotions of one's self and others effectively.

  Daniel Goleman says that emotional competencies are not innate talents, but rather learned capabilities that you can greatly improve through increased awareness and commitment to change. Using the model created by Goleman, a person's EI is based on appraisal of the following competencies. The first two are personal and second two are social competencies:

  > **Greg Balestrero: "**I am in 100% agreement… critical addition. As I mentioned before, this is a comprehensive assessment process in and of itself. It requires individual assessments, a group assessment, and then a focus on specific values the group wishes to improve. And, the project leader is not in a position to 'manage or adjust' the EI competencies….it requires outside coaching to improve both.
  > Again, couldn't agree with you more, but the ability to coach and train this out of others requires a specialist…perhaps an outsider from the team, not the project team leader."

  - o Emotional self-awareness: the ability to perceive one's own emotions.
  - o Emotional self-management: the ability to manage one's own emotions.
  - o Social awareness: the ability to perceive the emotions of others.
  - o Relationship management: the ability to efficiently manage the relationships (leadership) with others.

  Emotional Intelligence. The capability to identify, assess, and manage the personal emotions of oneself and other people, as well as the collective emotions of groups of people." (PMI 2013, p.537.) *"The project management team can use emotional intelligence to reduce tension and increase cooperation by identifying, assessing, and controlling the sentiments of project team members, anticipating their actions, acknowledging their concerns, and following up on their issues."* (PMI 2013, p.274.)

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Case Study Example: Improving the Cognitive Readiness of the PMI Board of Directors
Using Emotional Intelligence Enablers.
Excerpt from "An Awakening to a Higher Purpose," by Gregory Balestrero (2012)

In 2003, as a "newly" appointed CEO of PMI, I was asked to help create a new culture for the PMI board of directors. With the help of a great friend, mentor and EI practitioner, Karen Vernal of Vernal Management Consultants (VMC), and the commitment of the PMI Board, we began a design process for creating a new leadership culture. With the use of EI assessments for our board and senior staff, we were able to create a baseline for identifying opportunities for better interaction and decision-making. The baselines created were not only for each individual member of the Board, but also as a "group" baseline that was a composite indicator of the EI capacity of the board.

The results were nothing short of amazing. Awareness immediately increased, improving interactions and relationships. However, longer term the entire culture changed, allowing for enhanced decision-making and strategic dialogue. We offered private coaching from the VMC team to help individual Board members accelerate learning and interactions. I knew, in 2006, that EI was working well. The Board culture and their work with one another, and with the individuals from the myriad of cultures around the world, were greatly improved.

Murray Woolf: "In this example the phrase **…with the commitment of the PMI Board** shows the importance of having 'buy in' by those who are to be participants in the culture change of Cognitive Readiness. On most complex projects, among the most key stakeholder groups are those who commission and sponsor the project in the first place. They, as much as any others, need to be willing participants in the Cognitive Readiness approach to project management."

Federico Minelle: "Do you think that the measurement of team members EI would be easily feasible (or otherwise be unreliable)?"
Authors' response: The case example cited above indicates that the use of EI enablers can produce useful and reliable results.

- **Metacognition Strategy:** Metacognition is a process by which an individual is aware of his or her own brain processes. In other words, metacognition is thinking about thinking. It can also be described as knowing about knowing. The goal of using metacognitive strategies is to make a person's thinking visible to themselves and others, as well as to achieve project outcomes. The theory of metacognition is usually attributed to John H. Flavell, who first coined the term in 1979 but we are of the opinion oriental arts have dealt with that theme earlier (Zen). In recent years, the strategies of metacognition have been increasingly applied in the project's environment. The basic tenet of metacognition is that by understanding what the mind is thinking during a running project, an individual will be able to focus his strengths and improve upon his weaknesses when taking part in a project. Metacognition brings to our awareness our own strengths and weaknesses with self-regulation and refocusing. Team members who demonstrate a wide range of metacognitive skills perform and complete their tasks better and more efficiently.

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> **Murray Woolf:** "At a more macro level, group metacognition requires that the Project Team be aware of the limitations of human capacity to dissect, absorb, distill, and apply immense mounds of raw data. Most Key Performance Indicators, for instance, are little more than human means of achieving Complexity Reduction. We use summaries, averages, hammocks, Earned Value and Total Float, and so forth to reduce the towering piles of raw data to something that yields a green or red light. Metacognition at the project level requires us to know our own limits. For instance, schedule *planned* data has a shelf life of roughly ten weeks. When we rely on such data past its expiration date, we toy with execution strategy deterioration."

- **Lateral thinking**: A term coined by Edward De Bono, is "solving problems through an indirect and creative approach, using reasoning that is not immediately obvious and involving ideas that may not be obtainable by using only traditional step-by-step logic. Lateral thinking deliberately distances itself from standard perceptions of creativity as either "vertical" logic (the classic method for problem solving: working out the solution step-by-step from the given data) or "horizontal" imagination (having a thousand ideas but being unconcerned with the detailed implementation of them.)"

  > *"Creativity is the ability to think and act in original and imaginative ways. The project manager exploits the creativity of individuals, the collective creativity of the project team and the organization they work within to the benefit of his project".*
  > (IPMA 2006, p. 100)

- **Cognitive Adaptability:** The extent to which entrepreneurs are 1) dynamic, flexible, self-regulating, 2) engaged in the process of generating multiple decision frameworks, 3) focused on sensing and processing changes in their environment, 4) then acting on these perceptions.

  > **Greg Balestrero: "**Terrific addition…but the question remains is this instinct; if not, then can it be facilitated by a project team leader or by an outsider?"

- **Resilience:** Resilience is a dynamic process whereby individuals exhibit positive behavioral adaptation when they encounter significant adversity "Refers to successful adaptation of an individual despite risk, acute stressors, and chronic adversities. Resilient people are more determined and they can enhance their efforts especially under difficult situation. " (Reza Gharoie Ahangar 2010) We must expand this definition to refer to team resilience, or the ability to adapt quickly to adverse conditions as a team. This could include some team members taking part of the tasks from other team members, or one member quickly helping another when the second member has stumbled or fallen.

- **Agency:** The concept of human agency, which is tightly correlated to resilience, can be defined as the ability to act proactively in the context in which it is inserted. The human function, which extends to both individuals and groups, translates operationally into the faculty of generating targeted actions for certain purposes. (Dr. Albert Bandura)

- **Self-Efficacy:** "Efficacy" is defined as the power to produce an effect.[12] Self-Efficacy is the measure of one's own ability to complete tasks and reach goals. Dr. Albert Bandura has defined self-efficacy as one's belief in one's ability to succeed in specific situations. One's sense of self-

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[12] Webster's Ninth Collegiate Dictonary.

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efficacy can play a major role in how one approaches goals, tasks, and challenges. Bandura in his paper "Perceived Self-Efficacy in Cognitive Development and Functioning" identifies this in the sense of efficacy, which is the key element for the analysis of human agency. People's beliefs about their efficacy in managing events and their proactive conduct influence their choices, levels of effort, perseverance, resilience, vulnerability to stress and in general the quality of performance. Investigation of personal self-efficacy beliefs in relation to a given behavior may then allow prediction of the behavior of the individual in a project environment. The efficacy beliefs exert their agency function differently depending on the type of action analyzed:

- When individuals perceive and are aware that they are performing at a high level this motivates them to continue and perform even better. This allows individuals to achieve high performance using proactive individual ability, even within an environment that does not facilitate the achievement of the desired goals.

- With regard to efficacy beliefs on the management of emotions and interpersonal relationships, there is a causal relationship between efficiency and interpersonal effectiveness.

- The sense of self-efficacy also acts on the determination and choice of personal goals. In this sense, the primary importance of efficacy beliefs, focusing on the controllability of the environment within which the choice is made, is essential in choosing their goals. A lack of perceived controllability will reduce the aspirations and goals to which they inspire.

The evaluation of the sense of self-efficacy is operationally defined by the measure of the beliefs associated with it. The Likert scale is a key tool in its measurement, but of course it must be used in a proper context that reflects the nature of the questions being measured. The standard method of measuring efficacy beliefs uses plans that describe the items and tasks of different complexity levels, and that people use to evaluate the strength of their conviction to be able to do the tasks required and involved.

- **Automaticity of action or Heuristics in judgment and decision making** is automatic activation of one's own heuristic schemes[13] that are used to perform rapidly, with very few mind resources. It is a particular human capacity to activate a cognitive pattern[14] without conscious awareness, as if it were a knee-jerk reaction. Automatic thoughts and behaviors are ones that occur efficiently, without the need for conscious guidance or monitoring. Most of our thoughts and behaviors tend to be automatic or have automatic components, and for good reason. It is usually the result of learning, repetition, and practice, which tend to enhance it and help to avoid their use when they lead to systematic errors or cognitive biases.

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[13] A heuristic scheme is a mental shortcut that explains how people make decisions, come to judgments, and solve problems typically when facing complex problems or having incomplete information. When somebody makes a judgment that is computationally complex, a rather more easily calculated "heuristic attribute" can be substituted. See also here .

[14] Skill acquisition starts as labored, conscious learning and after consistent, frequent practice becomes more automatic and unconscious. Once the action is well learned, the behavior becomes automatic in the sense that it does not require constant conscious monitoring ("Psychology of Automaticity of Action" Elsevier Science. International Encyclopedia of the Social & Behavioral Sciences)

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- **Communication strategy:** knowledge of principles of psychology for persuasion and persuasive communication. Dr. Robert Cialdini identifies and explains the six universal principles of persuasion: Reciprocity, Commitment (and Consistency), Social Proof, Liking, Authority, and Scarcity.

  > *Persuasiveness is the ability to achieve consensus on common goals, through debate or force of argument. Persuasiveness can help ensure that worthy ideas are heard and implemented; i.e. the ideas that help achieve project objectives. Persuasiveness is needed to induce others to undertake the course of action the project manager needs to follow in pursuing the interests of the project.* (IPMA 2006, p. 94.)

- **Arousal:** is a physiological and psychological state of being awake or reactive to stimuli. It involves the activation of the reticular activating system in the brain stem, the autonomic nervous system and the endocrine system, leading to increased heart rate and blood pressure and a condition of sensory alertness, mobility and readiness to respond. Arousal is important in regulating consciousness, attention, and information processing. Arousal is involved in the detection, retention, and retrieval of information in the memory process. In other words, the retention and accumulation of information is strengthened when exposed to arousing events or information. Arousing information Aurosing information is also retrieved or remembered more vividly and accurately.

- **Assertiveness** *"Assertiveness is the ability of the subject to use any relational context, modes of communication that make it highly probable positive reactions of the environment and negate or reduce the possibility of negative reactions." (Libet and Lewinsohn).* Assertiveness is a flexible mode of communication through which they assert their own points of view without overpowering either be pre-loaded, the point of balance between aggression and passivity. You can find a proof of assertiveness in martial arts where instead of trying to confronting straightly with the strength of the adversary you tend to exploit to own favor. In NLP it is spoken in terms of Trace, and Rapport, being matched with the strength we have in front and then push it and direct it in the direction we want, using its own strength. The Judo uses that one as the willow bends to the weight of the snow until it falls and return to the initial state without having suffered no damage, no broken branch. A good example it might be as the water can adapt to (contextual) "container". The assertive communicator have the mindset, emotional state, and techniques to project the representation of the world and lead others, if necessary, to their own. Another essential element is empathy, that is able to capture the perspective of the interlocutor assuming its point of view.

  > *"Assertiveness, the ability to state your views persuasively and authoritatively, is a competence the project manager needs to help ensure effective communications with the project team and other interested parties, so that decisions that affect the project are taken with full knowledge of their consequences. The project manager avoids being led or manipulated by others into taking or recommending decisions not in the interest of the project".* (IPMA 2006, p. 94.)

3.2 Familiarize Affected Project Managers and Team Members with the Concepts of Cognitive Readiness to Create the Appropriate Level of Cognitive Awareness: this will be done through seminars and workshops led by persons who are appropriately expert in these cognitive psychology concepts and

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their practical application in a project setting. As Balestrero points out in the adjacent comment, this initial "awareness" training will require a strong, expert facilitator or coach. Convincing senior managers to invest in this training will often be difficult, and this is the basic purpose of this report. We present justification for such investment in the remainder of this report, and propose further actions in support of our arguments in Section 9, Call to Action. This

> **Greg Balestrero:** "My experience as CEO of three different organizations "screams" at me about this…awareness is insufficient. It requires "coaching and facilitation" in the depth of action. I don't believe that awareness alone will do much unless a strong facilitator or coach can bring them into action."

awareness training will be followed up with the cognitive appraisals of the project team discussed next.

3.3 Conduct the Cognitive Appraisals of Individual Team Members and of the Team as a Whole: these

appraisals are most important at the time the project team members are actually identified, and at the start of each phase in the team development (forming, storming, norming, performing). The appraisals will focus on the cognitive readiness criteria judged to be important within the specific project category and organizational environment at hand. The appraisal results will be recorded using a Cognitive Readiness Dashboard based on those selected criteria. This Dashboard has yet to be designed and used, and will be a central result of the actions that we are recommending in Section 9 of this report, together with the

> **Bob Prieto:** "Project Readiness reviews I have led focus heavily on some top level issues which can enable or disable the team's performance and undermine cognitive readiness. Prime among these issues is clarity of Strategic Business Objectives, as project failure is highly correlated with poorly defined or articulated SBO's. It is hard to build good team-based cognitive readiness when the framework as defined by SBOs is shaky, ill-defined, or worse, non-existent."

procedures needed to appraise both the cognitive readiness of the individual team members and the project team as a whole. The purpose of the dashboard (*cruscotto* in Italian, *salpicadero* in Spanish, *tableau du bord* in French, *painel de instrumentos* in Portuguese) will be to provide a visual indication of the level of cognitive readiness of a team related to key attributes or characteristics.

Edward De Bono's well-known "six-hat" approach to thinking is shown in Figure 5, and can be useful to define different roles for project team members. These roles will often be interchanged between team members over time.

COLOURED HAT	THINK OF	DETAILED DESCRIPTION
(white hat)	*White paper*	The white hat is about data and information. It is used to record information that is currently available and to identify further information that may be needed.
(red hat)	*Fire and warmth*	The red hat is associated with feelings, intuition, and emotion. The red hat allows people to put forward feelings without justification or prejudice.
(yellow hat)	*Sunshine*	The yellow hat is for a positive view of things. It looks for benefits in a situation. This hat encourages a positive view even in people who are always critical.
(black hat)	*A stern judge*	The black hat relates to caution. It is used for critical judgement. Sometimes it is easy to overuse the black hat.
(green hat)	*Vegetation and rich growth*	The green hat is for creative thinking and generating new ideas. This is your creative thinking cap.
(blue hat)	*The sky and overview*	The blue hat is about process control. It is used for thinking about thinking. The blue hat asks for summaries, conclusions and decisions.

> **Federico Minelle:** "I have seen various models of the "competence evaluation" process, mainly based on self-assessment followed by a supervisor review (openly discussed with the evaluated person). Main difficulties are time constraints for the process and the agreement on target to be achieved… Have you considered a solution to similar difficulties?"
>
> **Authors' response:** The process we are proposing results in a highly improved team effectiveness that produces real and measurable results in project performance and resulting profitability. We feel this return on investment of time will persuade management teams to invest in the process rather than simply 'jump through yet another hoop that I must jump through.'

Figure 5. Edward De Bono's Six Hats Describe the Different Ways of Thinking. Source: John Kapeleris Journal http://johnkapeleris.com/blog/?p=418

To these six roles we can add these individual *behavioral characteristics*:

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- The Proactive, whose peculiarity is acting in advance of a future situation, rather than just reacting.
- The Intuitive, whose peculiarity is acting where feelings are the driver for making decisions.
- The Strategist, who always thinks strategically to solve a problem.
- The Driver, who drives the other PM team member because of his or her charisma.
- The Communicator, who is particularly skilled in relationships.
- Left brain thinkers, who analyze things and introduce logic to a problem or challenge.
- Right brain thinkers, who are more holistic and intuitive.
- Innovators, who prefer 'to do things differently.'
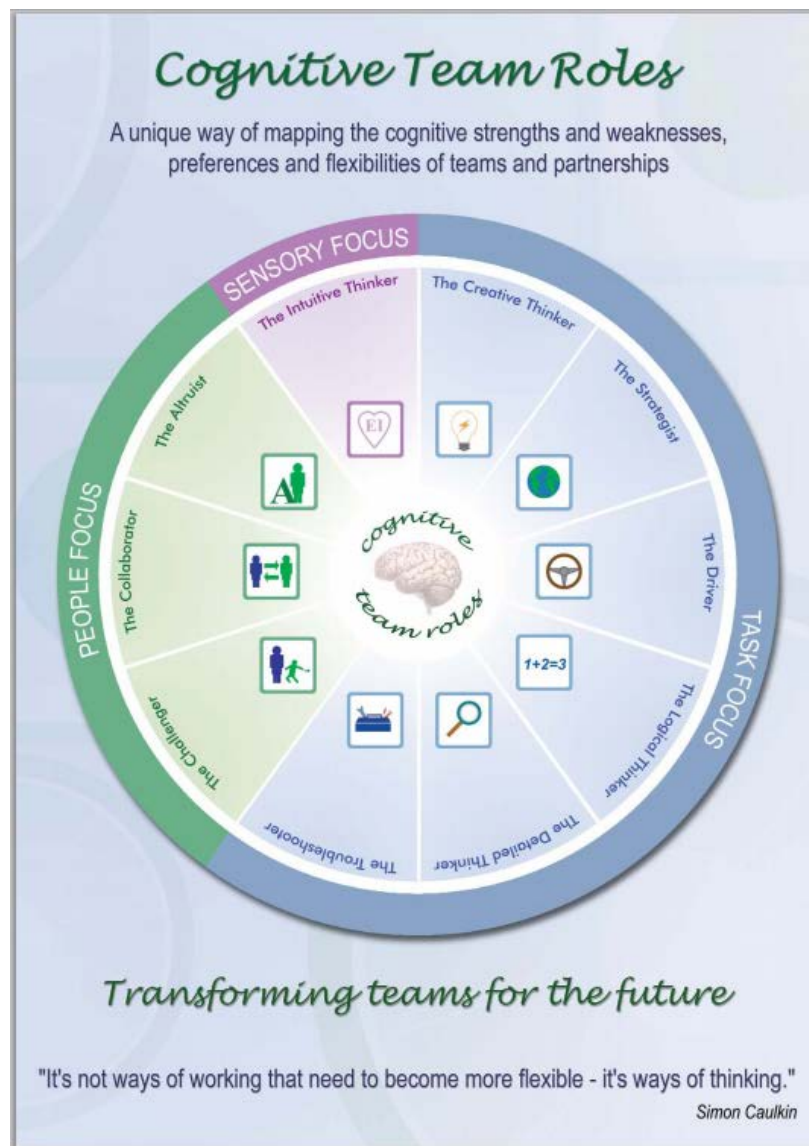
Figure 6. Cognitive Team Roles. (Source: Cognitive Fitness Consultancy, 2013)

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Figure 6 illustrates how one consultancy in the United Kingdom views team roles from a cognitive perspective. See Cognitive Fitness Consultancy 2013a for a useful case study on developing high performing teams using these roles. These various roles and characteristics will be useful in designing a method for appraising cognitive readiness of a project team. Our discussion here is intended to appraise an existing project team, and not to use these role definitions while initially selecting the best mix of team members for a new project. Usually the primary criteria for initially choosing team members is their technical or specialist skill and experience, and not their cognitive capabilities. Of course it is valuable to consider the need for these various roles when creating a new project team.

3.4 Develop and Monitor the Project Team's Cognitive Readiness: A cognitively ready project manager leading a cognitively ready team will be alert to any conflicts and interpersonal problems within the team and will periodically monitor what is happening within the team. As new team members are added, which is usual when the project passes into a new life cycle phase, further indoctrination of the new members is conducted, and re-appraisal of the team's cognitive readiness is performed. When weaknesses are revealed, additional cognitive awareness training is conducted to continually improve the team's cognitive readiness. This is the ultimate goal of developing cognitively ready project managers. For the first project using this approach the project manager will probably need the assistance of an expert cognitive coach.

These four steps describe the process of creating awareness of the importance of how team members are behaving in their team, and of appraising and developing cognitive readiness in the team. Successfully applying these concepts within a project team will produce a high level of interactive teamwork and greatly increase the success of the team and of its project.

Greg Balestrero: "Identifying and measuring cognitive abilities has to be culturally accepted in the context of the overall organization… In practical terms, if the company doesn't value this type of assessment, then it will not be valued, nor supported. This is especially true in the realm of governments. For example, In the U.S. Federal government workforce assessment is influenced greatly by federal unions, and is often done in a fashion that is disconnected from the context of a performance evaluation. Also, assessments in the form of Myers-Briggs or EI are not the norm in businesses, which are core to measuring cognitive ability…. This is not something the team can do simply…I still believe a project coach or facilitator is more effective, especially in interpreting the group's EI quotient."

Murray Woolf: "I agree with Greg as to needed 'buy-in,' which he correctly notes to be difficult in most organizations. As I read this paper, I find myself necessarily remembering that this is supposedly about "projects" not just organizations that may operate projects. In certain industries, such as Construction, project teams are much more ad hoc. The idea of developing and monitoring Cognitive Readiness will be especially challenging, if not impossible for the widest composition of the 'Project Team.' If we define the Project Team more narrowly, there is a chance of such application, but even then it may oppose the autonomic structure and authority of established Project governance."

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Bob Prieto: "There has been growing focus in large project organizations of the importance of these soft issues. It is not unusual to see training related to leadership, communication, negotiation, dealing with difficult people, and cross cultural awareness. This latter point is becoming more important as projects not only scale up and increase in complexity but also have execution teams extending clear around the globe. Tools which have been selectively used (Prieto 2011, Chapter 3) are:

Engage the Team Emotionally
It is now important to take the team through a set of exercises to draw out issues related to resistance to change and transitions, cultural perceptions, and other similar emotive issues that will help draw out and work through these deeper seated threats to program success. This engagement process is facilitated using a range of frameworks to identify the issues and increase awareness about the importance of emotion and values in leading change. Many models exist for these processes, and what is described below is intended to be illustrative.

The "Bridges" model. Focuses on the emotional and psychological component of leading change. It emphasizes the need to mark out clear "endings" and be alert to the apprehension that arises in the transition between endings to new beginnings and the importance of stepping through each distinct phase of transition.

Cross-cultural models. Focus on the differences in cultural mindsets that shape perspective, leadership style, approach to risk, decision-making, thought, and language patterns. The aim is to increase awareness to how the different members of the team gather information, use time, respond to different types of leadership, make decisions, communicate, listen, engage, and use nonverbal behavior.

Leadership values grid. Focuses on mapping the underpinning group dynamics and working relationships. It draws together "what matters" to each individual on the team and combines this into a solid relationship foundation based on values."

Authors' response: These and similar items provide excellent tools for adding to them the cognitive enablers and constraints that are discussed below in Section 4.

Murray Woolf: "I would be much more satisfied with this paper if it included an acknowledgement of the role of "process," not just people. So far, of what I have read, "readiness" is about people being ready to act cognitively. But most organizations are structured by processes which transcend the arrival and departure of individuals. In smaller, growing organizations, it is these processes (standard operating procedures) that provide consistency and define the very operational culture of the organization. What happens to project success if the people are cognitively ready, but their processes are not? By example, Cognitive Project Management has focused on changing standards and "best practices" to allow for cognitive influence over decision-making, problem-solving, project resiliency, and daily management of project activities."

Authors' response: We entirely agree with this important comment. The impact of established processes on the ability to achieve cognitive readiness of the team certainly must be recognized. In fact project team recognition of the need to revise and improve established processes has proven to be a powerful source of increased project success, as indicated in Archibald et al 2013, "A Team-based Approach to Continuous Improvement in Program, Project and Portfolio Management—The U. S. Government's Global Threat Reduction Initiative." This important topic must be addressed separately.

3.5 Front-End Investment is Required to Assure that both the Documented Project and the Project Team Are "Ready": No project normally will be authorized to start unless it is judged to be "ready", which usually means having an approved business case and project charter in hand. Today, for most projects, this does not usually include any assurance that the proposed project team is "ready" in any sense other than the people are available to work on this project. Of course this usually limited document readiness, not including team cognitive readiness, requires investment of time and money. In some industries, such as the design and construction of infrastructure facilities, project readiness is measured by a Project Readiness Index (PRDI), as developed by the Construction Industry Institute. And yet in many projects their team is thrown together and expected to start work with little or no team preparation. A professional sports team will spend weeks, perhaps months, practicing as a team prior to its

Murray Woolf: "An interesting analogy [to sports teams], as I used a similar one to describe Improvisational Management (in Cognitive Project Management) where the Project Team practices a core set of response techniques that can be invoked as needed. Much like a baseball pitcher has a number of different pitches he can throw, which repertoire he draws upon from the catcher's hand signals. Likewise, the football quarterback need only whisper "button hook" and the team knows what to do. Improvisational Management, which includes early rehearsals, is a much more credible and effective antidote for the unwanted effects of Unknowns than the layering of contingencies that are promoted by classic Risk Management."

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first competitive encounter on the field of play. Additional investment of time and money is also required to prepare every project team to work together effectively by achieving team cognitive readiness, as described above. An important part of this front-end investment in the project team also involves team planning during the project start-up phase, as described in Archibald 2003, pp. 280-300.

The detailed methodologies for appraising and developing individual and project team cognitive readiness remain to be prepared for specific situations. The currently used tools mentioned in the above comment by Prieto are representative of what can be adapted to focus on the cognitive enablers and constraints that must be involved in appraising and creating cognitive readiness of the project manager and the full project team.

4. Cognitive Constraints and Cognitive Enablers

We introduce here two classes of cognitive behaviors that are identified as cognitive constraints and cognitive enablers. These are generated by the way people's minds give meaning to the world around them based on their knowledge, perceptions, beliefs, how they elaborate the information emotionally, and how much they are aware about that (metacognitiveness) using all the personal cognitive capability they have obtained through their life experiences within the cultures in which they have existed. These cultures include family, peer, religious, spiritual, political, national, educational, vocational, recreational, and others. Both cognitive constraints and enablers will be included in the criteria used in appraising a team's cognitive readiness, as discussed earlier in Section 3.

4.1 Cognitive constraints are a specific set of emotive and rational beliefs that brings a subject into a particular state of mind in which he will reveal himself less effective/efficient at the job he was assigned. They have always had an important impact on the success of a project and on the end results produced by the project. Since every project is created, planned, executed and controlled by a team of individuals, these constraints will always be present during the entire life cycle of the project if not resolved early in first project phases. They can directly affect the overall success of every project and program since the project team performance directly impacts the project, its products, and all project stakeholders. Well-known examples of cognitive constraints are:

- The Student Syndrome (The phenomenon that many people will start to fully apply themselves to a task just at the last possible moment before a deadline. This leads to wasting any buffers built into individual task duration estimates. It was noted by Eliyahu M. Goldratt in his novel titled **Critical Chain**.)
- Parkinson's Law. (The work at hand expands to fill the time available.)
- Burnout Syndrome. ("Exhaustion of physical or emotional strength or motivation usually as a result of prolonged stress or frustration.[15]")
- Internal conflicts that can lead to crises.
- Drastic commitment reduction.
- Overloading stress.
- Multi-tasking stress. (Trying to do many tasks simultaneously.)
- Competence Borderline Syndrome or cognitive balance (I'm going to do just what I have to do, no more!)

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[15] Merriam-Webster's Collegiate Dictionary.

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- The Skill Syndrome (I know my job and I've been doing in this way, why would I change it? And what happens if I am not able to manage the innovation?)

  (The present authors have contributed the names the last two items in this list.)

To this list **Prieto** has added these cognitive constraints:

- Cognitive lock (see Section 2.5 above)
- Haste (as in the well-known adage "Haste Makes Waste")
- Over commitment to bureaucratic goals (versus SBOs of the project)
- Prisoner to heuristics, or the Prisoner's Dilemma[16]
- Denial (of adverse developments or events)
- Fear of satisficing[17]
- Perfection is the enemy of good.

These cognitive constraints can cause or contribute to the failure, lack of total success (especially in key stakeholders' perceptions), a slowing down and a cost increase of a project. All these examples have a common key: the human factors that are now recognized as potential cognitive constraints. In project planning, cost and other estimating, scheduling, evaluating, and controlling processes, where the metrics are dependent on the classic four factors of scope, cost, time, and quality, the project management discipline's natural development suggests that two new factors should be evaluated: Cognitive Constraints and Cognitive Enablers, creating an additional element in PM metrics: Cognitive Readiness.

4.2 Cognitive enablers are those factors that can improve and accelerate collaboration and creativity in teams. The principal types of cognitive enablers (some specific examples of which have been described in more detail earlier in Section 3) are:

> **Murray Woolf:** "Under which of the following four items do we find those emotions that manifest and ultimately constitute our character? A pet peeve I have with many so-called 'sophisticated' analytic methods is that they dismiss the 'human element' from their predictive models. Case in point: Monte Carlo Analysis, used to 'more accurately' predict when a project will complete. Yet these models treat the activities in a schedule like steel balls in a pinball machine or dice tossed onto a green felt. The activities in a schedule model real-life actions in the field, and these are all performed by people—individuals who take pride in their work, whose word is their bond, who treat others the way they wish (and demand) to be treated. My point is that a powerful Cognitive Enabler emanates from within us, and oozes out into the Project Team where it infects and activates."

- **Cognitive Appraisal** of what is happening at any given moment: our emotions are based on how we perceive a particular situation. For example, thinking "Why is she reacting so angrily to this particular change request?"

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[16] The **prisoner's dilemma** is a canonical example of a game analyzed in game theory that shows why two individuals might not cooperate, even if it appears that it is in their best interests to do so.

[17] **Satisficing**, a portmanteau of *satisfy* and *suffice*, is a decision-making strategy that attempts to meet an acceptability threshold. This is contrasted with optimal decision-making, an approach that specifically attempts to find the best option available. A satisficing strategy may often be (near) optimal if the costs of the decision-making process itself, such as the cost of obtaining complete information, are considered in the outcome calculation..

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- **Cognitive Adaptability:** the degree of how easily we use the cognitive trade-offs to modify some of our beliefs without causing difficult cognitive dissonances (McLeod 2008, Festinger 1957.) Cognitive dissonance theory suggests that we have an inner drive to hold all our attitudes and beliefs in harmony and avoid disharmony (or dissonance).
- **Metacognition:** the cognitive awareness of his or her own brain processes by an individual, and in the project team situation this would refer to the sense of team by all the team members.
- **Emotional Intelligence:** the EI Quotient is the ability to perceive, assess, understand and influence the emotions of oneself and others effectively.

Greg Balestrero: "Just a fact about EI: one can't 'control' the emotions of others…they can react to them, and try to be sensitive to others' needs…but never control the emotions of others. This is not a subtle issue here. EI is about sensitivity and personal reaction, not about controlling others"…. Knowing an individual's EI quotient "… is not common…EI assessments are typically held confidential. It is typically the EI quotient of the group that is shared…this would hit a wall in most organizations due to HR policies….I believe it is more important that the team is aware of their EI quotient, and that they are coached to another, higher level of EI."
Murray Woolf: "Agree with Greg. I have long argued that there is no such thing as Project 'control.' The most Management can ever hope to do is motivate."

The cognitive enablers or accelerators take the project ahead faster by repeated sprints. Those sprints can transform the traditional project Earned Value (EV) from a predictive element to something dynamic, reactive and adaptive. And every project manager knows how important (crucial?) it is to have the possibility of high accelerations when a scheduled date is not achieved as expected and impacts the EV.

The transition from a cognitive constraint situation to a cognitive enabler is always guided and catalyzed by the emotional factor (Daniel Goleman). It is the individual himself who decides to "set again the priorities".

One of the most important methods of activating cognitive effectiveness is through direct and personal examples of cognitive behavior by the project manager. The EI allows the cognitively ready project manager to plan strategies and take suitable actions according to the team members that are involved. This brings team members' (and also stakeholders') knowledge into the project with good intentions and results. By creating in them feelings that their contribution is highly valuable then they'll express it through self-efficacy. This approach will take human behavior to a higher self-perception than previously and will increase their ability to exploit the available information to attain greater creativity and satisfy each psychological need (Abraham Maslow).

A mind free from heuristic schemes is a mind capable of new consciousness of a new awareness.

5. Delivering Business Value

5.1 Focusing on Stakeholder Value Perceptions Using Cognitive Readiness: A cognitively ready team is able to manage relationships within the team to understand and create the benefits that can be considered as business value perceptions by the project's stakeholders. "*For the incubation phase to work effectively, the organization must have a clear understanding of the differences between benefits and value. Value is the quantification*

Bob Prieto: "The German nuclear industry was singularly unprepared to deal with changed stakeholder reactions post Fukishima. The reaction was not immediate but delay in recognizing it allowed momentum to build to a tipping point. This is where cognizance of the broader environment and its impact on the more immediate solar system of stakeholders comes into play."

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of the benefits."[18] So value is what stakeholders get from the project and what they perceive as worthwhile to pay for, support, or not oppose, and consequently behave using cognitive enablers or to the contrary overcoming cognitive constraints.

And stakeholders' value perceptions probably will change during a project, making it crucial that the project manager and the team apply their cognitive readiness capabilities to read and properly respond to those changing stakeholder value perceptions.

According to the PMI PMBOK:

> "*Stakeholder Analysis is a technique of systematically gathering and analyzing information to determine whose interests should be taken into account through the project. It identifies the interests, expectations, and influence of the stakeholders and relates them to the purpose of the project. Assess how key stakeholders are likely to react or respond in various situations, in order to plan how to influence them to enhance their support and mitigate potential negative impacts."* (PMI 2013, p. 395.)

In the Incubation/Feasibility phase of a project the project team can analyze these stakeholder topics:

- The forces the stakeholder is involved with, personal interests, the internal rules and probably the most important one, **identifying hidden needs.**
- The **Innovation Readiness of the stakeholders,** because these factors ensure more willingness to change. Innovation Readiness can be identified as a mental state where the individual is positively ready to change as required in strategic transformative projects.[19]
- The "**emotional shared value**" because it could be a "flag to defend" by the stakeholder, causing her to favor or disfavor the project and its results.
- The individual who can represent the "**key stakeholder**" who usually can strongly influence the other stakeholders.
- The communication strategy of the team for each stakeholder and situation to keep them all on board.

5.2 Successful Innovation is driven by the Value Created: The value realized by a project may not be immediately perceived by some stakeholders as a benefit, and we have to consider also the value that the project outcome could bring into a program business context, especially if we are in presence of innovative transformative project and program.

> "*Today's changing economic climate, marked by an increasingly competitive global environment, is driving project managers to become more business oriented. Projects must now be viewed from a strategic perspective within the context of a business or enterprise that needs to <u>provide value to both the customer and the organization itself</u>.*

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[18] Private comment by Dr. Harold Kerzner from his review of an earlier paper by the authors of this present paper: "The Six-Phase Comprehensive Project Life Cycle Model Including the Project Incubation/Feasibility Phase and the Post-Project Evaluation Phase"; download in *PM World Journal* and in *AllPM*.

[19] For a useful discussion of the importance of project management to achieving innovation see **Leading & Managing Innovation**, 2013' by Russell Archibald and Shane Archibald at http://leadingandmanaginginnovation.com

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> *As a result, project managers are now required to possess the skills to complete a project within certain specifications, and also know how to create and deliver value.* [emphasis added] (Dr. Harold Kerzner and Frank Saladis 2009.)

Those two aspects can be monitored, improved and perfected during the Post-Project Evaluation Phase after the standard Project Close-out Phase (see Archibald and Di Filippo 2012.) Usually the project team will have been disbanded during the Project Close-out Phase, so conducting the Post-Project Evaluation Phase, with its four dimensions of project management, the project's product or result, stakeholder satisfaction, and cognitive readiness of the project team, must be conducted on behalf of the project owner by the appropriate Project Management Office or, in organizations following PRINCE2 methods, by the manager appointed by the Project Board.

So we can satisfy the success criteria of a project respecting its triple constraints (time, cost and scope) but we do not forget to meet the needed value of the project and of the business. "*Time and cost used to drive all decisions," said Dr. Kerzner, "Now we're saying, 'Wait a minute, are we providing value? If management doesn't see how a project will deliver a value, that project will be canceled even if it's meeting time and budget constraints.*" (Kerzner 2009.) Of

> **Bob Prieto**: "I would suggest even more explicitly, is it supporting the organizations SBOs? An investment, even if well executed and potentially profitable, but not in line with a firm's SBOs, is likely to be eliminated in a period of continuing focus on capital efficiency."

course this project evaluation must be carried out during all phases of the project life span, and not simply during the post-project evaluation phase. So success is achieved when you simultaneously achieve:

- Project success - meeting the triple constraints of project management, the goals of the product of the project, of the values inherent in the stakeholders' perceptions, and those inherent in cognitive readiness; and
- Program and Portfolio success - meeting the success of all the projects within programs and portfolios while achieving the target values envisioned in the strategic business plan using a holistic or systems thinking perspective. *(PMI 2013, p. 395.)*

> **Murray Woolf: "**Of course the elephant in the living room is the confirmation of a causative relationship between all of these gallant efforts to raise awareness and achievement of Cognitive Readiness ... and the actual outcomes of the project. When projects fall short of their goals despite Cognitive Readiness, will this doom its repetition on the next project? And if the project is successful, will its success be attributed to Cognitive Readiness? On what tangible and provable basis does/can this paper insist that Cognitive Readiness will necessarily correlate with project success?"
> **Authors' response:** At this stage we can only point to the success reported by researchers in high-performance teams within manufacturing and process industries that we referenced in our Executive Summary on page 1 above. The recommended actions in Section 9 of this report, Call to Action, are intended to create documented evidence of the benefits of developing cognitive readiness in project teams.

5.3. Project Value and Success should include Intangible Benefits: Project success is achieved only when business values are achieved, and business values usually also include the 'intangibles.' During the Incubation Phase we begin producing (and buffer in suitable storage) a project value baseline that will allow us, as project manager, to get through to the start phase with a sufficient safety margin. While developing *Cognitive Readiness* in the high-performance team **we are profiling and creating value**. While enhancing the team's cognitive consonance **we are enhancing the baseline value**. Although the team at the end of the

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project is dissolved, the team members **will maintain the value of the cognitive competences achieved**. If those team members belong to the company they might be used again in a future project. And the data obtained could be stored in a database of a specific application. This of course means that we have some tools (surveys, interviews, others) to record the existing and new cognitive competencies developed during the project. Those data could then be utilized promptly in the next specific project that needs those specific capabilities that were enhanced during the preceding project. Thus we are creating, within the company, value in the form of "Cognitive (and other) Intangibles."

Harold Kerzner: "But all is not lost. I believe that you can measure the value of a project and that it can be done with metrics and KPIs, and with a minimum of assumptions. Looking at individual projects or categories of projects is easier than looking at all of project management. And for an individual project, value can be expressed quantitatively in financial terms and is more than just the profit margin on a given project. We can also discuss future value to an organization."

Prof. Federico Minelle raises the point "*intangible values are to be measured.*" We believe the process is to identify the benefits that the intangibles produce, and then measure those benefits. The intangible values created by high-performing teams will be measured in greater project success: faster, cheaper, better, and higher stakeholder satisfaction, in both the current and future projects.

For those project-driven companies that sell projects to others, a common intangible value of a completed project is the willingness of the customer for that project to sign a contract with the company for the next project. A high-performance team satisfies the key stakeholders' perceptions of value from the completed project, including their comfort and satisfaction with how they were personally treated by the project team members.

Greg Balestrero: "Absolutely a fact that should be in everyone's mind…also, it should be in every project manager's mind, because even when it is an internal project, there is always the "build or buy" model…should I just get this done using outside project managers, since our internal project performance is poor."

The importance of intangible values are also pointed out by Balestrero in his on-line comments in 2008 about a July 15 2008 discussion session on Researching the Value of Project Management:

> "*Their evidence points to the fact that it's not only tangible results that were achieved, but also intangible, such as better enterprise-wide decision making, more effective work culture, and stronger and clearer communication. In fact, they have identified a clear relationship between project management maturity and a rise in* **intangible benefits.**"

 As project manager, during the project we might be asked: are you providing value? If we and the team are cognitively ready then we could certainly respond: of course! After the conclusion of the project we also could be asked: have you provided value? We certainly could answer: Absolutely!

6. The Dimensions for Determining and Ensuring Project Success

During the Post Project Evaluation Phase[20] of the project life cycle there are at least four main dimensions for measuring and determining the overall project success:

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[20] This is the phase following the Project Closeout Phase; for a discussion of the Post Project Evaluation Phase see Archibald and Di Filippo 2012.

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1. **Project Management Dimension:** How closely did the project achieve the original objectives as defined in the Project Charter or Project Business Case: scope, budget, schedule, and quality?

2. **Project Value Dimension:** how closely did the project meet the planned value of project including both the tangible and intangible values?

3. **Product Dimension:** How well does the product meet the functional and business objectives that were used to establish the Project Charter and Business Case? Does the market like, buy, and use the product?

4. **Stakeholder Satisfaction Dimension:** What level of satisfaction (accomplishment, enjoyment, pleasure, anger, conflict, frustration) exists after the Project Closeout Phase in each of the project stakeholders?

In Addition to these Four Dimensions an overarching New Perspective of Project Success is within our Vision: Project Team Performance. The above four dimensions will determine the degree of success that has been achieved by a given project in quantifiable terms. However, the manner in which the work was done to complete each task that was needed to execute the project contributes directly to each of these dimensions. In aggregate we refer to this as "project team performance." Project team performance concerns *how successfully* the project was planned and executed, while the four measurement dimensions concern *how successful* are the project results. We propose here recognizing and adding this perspective of project success:

> **The Project Team Performance Perspective:** Did the project team achieve the highest possible level of performance within the existing situation? What was its performance rating compared to other project teams in similar situations? Did it achieve the fullest Cognitive Readiness that could be expected? What percentage of the team's members will carry high-performance values to their next project team?

Cognitive constraints and enablers have always had an important impact on the success of a project as well as on the end results produced by the project, but they are rarely, if ever, identified and evaluated. This report has provided some practical guidelines for evaluating the success of both the project and the project's results or products as related to this important **team performance perspective**. Recognition and adoption of this element for achieving project success will have long-lasting impacts on all future projects and programs within the enterprise, as well as on the results of any specific project being evaluated.

7. Enhance Yourself, Enhance the Team: Be "Cognitive"!

When the Project Manager performs cognitively the Project Team will follow: The introduction of the "Cognitive" team performance dimension in the Project Management business model requires something new in the application of the model. There are many project managers who have considerable soft skills, and these competences are not certified in any direct way. A project manager who develops competencies such as *agency* and *commitment*, and is able to communicate clearly what the project objectives are, may need further training in specific hard skills, but he already has half of what he needs to be a great project manager. The soft skills are reflected in competency, and the project management certifications that are based on proving levels of competency, in additional to

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knowledge, including the certifications provided by APM, IPMA and others that require proof of accomplishment and personal interviews, are the best indicators of these qualifications that are available today.

Both hard and soft skills are required: Why do certain teams have success and others do not when starting from the same level of technical competences? Simple: there's a "dark zone" in the model, and we're talking about the soft skills. Soft skills should not be lightly considered when building a team. This is the reason why project managers should be incentivized to attend soft skills courses. A Cognitive Project Manager will be a 360° qualified manager who possesses all the skills he needs, both hard and soft. There are many reasons for project failures and for project success, as indicated in the abundant project management literature on this subject, and project team performance is only one among these many. Nevertheless, we believe that the investment required to achieve high performing project teams using cognitive readiness concepts will be returned several-fold.

Effective Project Team Leaders Must be Cognitive: Cognitive Project Managers will be able to manage the cognitive procedures presented in a summary way in this report, but that's not the main reason they developed the "Cognitive" attribute: they need to be "Cognitive" because they lead a team of people, and cannot simply use a sequence of predetermined notions to be activated as necessary in a mere automated system. They must be able to create, at any moment, the most suitable psycho-cognitive strategies. This will consolidate the figure of the Cognitive Project Manager as a real leader who can influence and change the heuristic patterns (*anchoring* and *behavior*) of the team members, and stakeholders too, and orient their personal goals with the project and company goals. They'll constitute a new generation of project managers capable of creating high-performance teams, who can *persuade* and above all *motivate* (with internal trigger action) team members and project stakeholders to develop the desired *agency, resilience and creativity*, who are capable of communicating "the positive wave" responsible for fine-tuning all the team members and stakeholders. People use both reasoning and emotions to reach their objectives: a good manager can get the best from both the hard skill and soft skill abilities of the members of his or her team.

Personality Appraisal Tools: Of course a project manager has several tools to his disposal in order to appraise team member personalities in the early and in fact all phases of a project , such as the Big Five[21], NEO PI-R[22], or MSCEIT,[23] that are extremely good in profiling the personality of potential team members, but one has to take any of these instruments as an assistance to complete your evaluation and not as the only reference.

The Project Manager's Direct Behavior Produces Optimal Flow in the Team: Adopting an imprinting strategy, as we might call it, to produce in team members and stakeholders, by direct behavior of the project manager the right emotional state at work. His is a **positive state** that induces people to be more and more motivated, engaged, and to rise to an **optimal zone**. This state is what some researchers have called **optimal flow** (as stated in this D. Goleman video), that is an internal state characterized mainly by:

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[21] openness, conscientiousness, extraversion, agreeableness, and neuroticism.
[22] a 240-item measure of the Big Five personality traits.
[23] The Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT)

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- Unperturbed attention.
- Their attention is two hundred percent.
- They possess complete flexibility and adaptability.
- They feel good and have fun when working.

A Cognitive Project Manager has just to act, to show the desired behavior because team members will just take this behavior from him. It is as if there were an invisible connection between the brain of the project manager and the team members' and stakeholders' brains. But is there is a scientific and proven explanation for this phenomenon? Of course: it is a recent discovery called the "social brain" produced by the study of two (or more) brains that interact with each other. These studies show that there are a number of neuronal networks that are like "neural radar" that carry on a silent conversation among brains using "mirror neurons". These mirror neurons give us the immediate unconscious sense what the other person is making or feeling. Mirror neurons are a bridge among brains a sort of a neural "Wi fi." The three neuroscientists who discovered the mirror neuron are Dr. Giacomo Rizzolati, Dr. Leonardo Fogassi and Dr. Vittorio Gallese.

> One of the main objectives of the contemporary neuroscience cognitive research, that
> branch of the neuroscience that has as its object of study the more sophisticated aspects
> of our intelligent behavior, is the project of cognition naturalization or social
> intelligence, which consists of understanding of the nature of the processes neural
> pathways that govern the relationship interpersonal inter-subjectivity. The problem is to
> understand the neural mechanisms that allow us to enter into communication with our
> fellow men, of sending them our wishes, our beliefs, our intentions, and while
> understanding what others do and why they do it. The ultimate goal of this project is to
> clarify the connection between the mechanisms of functioning of the brain and our social
> cognitive skills. (Dr. V. Gallese *Neuroscienze e fenomenologia*.)

So our calling here is simple:

- **Be "Cognitive"** to get the best from your team, your projects and yourself!
- **Enhance yourself cognitively** to Enhance your team
- **Be a High Performer** to build a High Performing Team

Caveat: Skeptical Opinions about Neuroscience. Objectively we are obliged to state that there are several qualified researchers in this field that are recently giving meta-interpretations about achieving the benefits that neuroscience in general may produce:

> "A series of new books [about neuroscience] …. include **A Skeptic's Guide to the Mind** (St. Martin's), by Robert A. Burton; **Brainwashed: The Seductive Appeal of Mindless Neuro-Science** (Basic), by Sally Satel and Scott O. Lilienfeld; and **Neuro: The New Brain Sciences and the Management of the Mind** (Princeton), by a pair of cognitive scientists, Nikolas Rose and Joelle M. Abi-Rachel …. 'The mind is and will always be a mystery,' Burton insists. Maybe so, and yet we're perfectly capable of probing flawed equipment with flawed equipment: we know that our eyes have blind spots, even as we look at the evidence with them, and we understand all about the dog whistles we can't hear. Since in the past twenty-five years alone we've learned a tremendous amount about minds,

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it's hard to share the extent of his skepticism. Psychology is an imperfect science, but it's a science. (Adam Gopnik, 2013.)

Careful (albeit selected) reading of two of these books reinforce our belief that the specific cognitive approaches cited in this report justify the general message contained in the present report: that developing Cognitive Readiness in project teams holds the promise of significant improvements in successfully planning and executing projects.

8. Conclusions

The principal inferences and deductions that can be drawn from the above discussion are these:

1. The project **is** the project team, with its capabilities in project management, functional specialties, and cognitive readiness, and therefore project success is directly related to the individual and group behaviors of the project manager and other project team members.

2. Human behavior within project teams can be observed and appraised to identify and influence specific cognitive constraints and enablers that directly affect team performance and therefore project success.

3. The specific cognitive enablers and constraints that are used in appraising and developing a project teams' cognitive readiness will vary significantly depending on the type or category of project that is involved, and the cultural, economic, technological, and political environments in which it exists.

4. Development of a Cognitive Project Requirement Model and also a Procedural Cognitive Model that includes the Cognitive Readiness Dashboard based on related and appropriate cognitive constraints and enablers will enable project managers to appraise and improve their project team performance both as a team and as individuals; this will contribute positively to the success of the project.

5. Project Managers can be enabled to become "Cognitive" and their competences in soft skills will be eventually certified. Cognitive Project Managers and Cognitive Managers will become unique figures in the Project Management panorama.

6. Project teams require front-end investment of time and money to assure their minimum cognitive readiness when a project is authorized to start, just as the project itself requires front-end investment in order to prepare the Project Business Case and Charter prior to it being authorized to start.

7. Cognitive Readiness within project teams will be recognized (at least in some industries and project categories) as a new key element in project management metrics together with scope, cost, time, and quality.

8. Many aspects of cognitive readiness can be measured and assessed but this needs systematic development. It is our hope that these findings and lessons learned will provide an impetus to future application, research and development of these concepts that are aimed at creating more cognitively ready individuals and teams across all domains.

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9. A Cognitive Coach will be required to work with project managers and their project teams for a period of time when introducing these cognitive concepts to most organizations and institutes until its project and program managers become sufficiently experienced to achieve the required cognitive readiness in their teams without this assistance.

9. Call to Action

As indicated throughout this report, development of cognitive ready project managers and high performance project teams can be achieved and should produce desirable benefits, including greater project success, increased delivery of tangible and intangible business values, and improved satisfaction of internal and external stakeholders.

Our call to action here is an appeal to practitioners, professional and industry associations, governmental and non-governmental agencies, and universities to initiate actions to apply, investigate and further develop the concepts of cognitive readiness in project, program, and portfolio teams that are described in this report.

Here are the actions that are called for in order to achieve the highest performance possible by project and program teams:

➢ **Project management (PM) practitioners within companies in all industries, governmental agencies, and non-government organizations:**
  ➢ Initiate a Cognitive Awareness Program to introduce the concepts of Project Team Cognitive Readiness to all levels of the organization structure, and encourage all project team members, project and program managers, functional managers, portfolio steering committee members, and executives to learn about how to achieve cognitive readiness in their project teams.
  ➢ Select a current project, retain a qualified Cognitive Coach, and apply the concepts described here on an experimental basis working directly with the Project Manager and key project team members.
  ➢ Conduct surveys of project managers and teams on current and past projects to identify the differences in their cognitive readiness level between successful and failed, or partially failed, projects.
  ➢ Define, plan and execute an organizational development project—building on the results of the above actions—to develop the needed policies and procedures to introduce and capitalize on the cognitive team readiness of all projects within the organization.

➢ **Professional and industry associations and appropriate foundations:**
  ➢ Solicit requests for proposals/RFPs from PM practitioners, consultants, and universities for grants and other financial support for projects to conduct research, surveys, experiments, and other activities to identify and develop methodologies and good practices related to implementing cognitive readiness of project teams; provide funding for those proposals that are worthy of support.
  ➢ Include the cognitive concepts discussed in this report in their calls for papers when designing and promoting local, regional, and global congresses and conferences.
  ➢ Include team cognitive readiness in their appropriate standards for project, program, and portfolio management.

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> ➢ Promote cross fertilization with non-PM oriented associations who are focused on appropriate aspects of human behavior, to encourage their integrating behavior within project teams in their research and other professional activities.

> ➢ **Universities with degree programs related to project, program, and portfolio management:**
>   > ➢ Introduce the cognitive concepts described in this report into their appropriate courses.
>   > ➢ Encourage their students in PM courses to study and perform research on the various aspects of cognitive psychology and project teams, and to produce papers and theses on these subjects for academic credit.
>   > ➢ Establish collaborative efforts with neuroscience and psychology departments to conduct joint research and develop and offer course curricula related to cognitive readiness in project teams.

The significant benefits of high performance project teams – better, faster, cheaper, with increased job satisfaction and enjoyment of life – requires a concerted effort by the global project management community. This Call to Action provides a roadmap forward to realize these benefits.

Cognitive Readiness Can Help Us Bring Peace to the World: Is cognitive readiness only a final goal in project management, or is it also a means to achieve a new level of awareness capable of influencing human behavior throughout the whole world? Widespread application of the cognitive concepts described in this report has the potential to overcome at least some of the adversarial attitudes and behaviors that are prevalent today in many regional, national, and corporate cultures through promotion of improved collaborative teamwork; this will help to reduce violent behavior beyond the project management world. By developing our closely related "Spiritual Intelligence" this can become a source of guidance in the world to achieve more peaceful settlement of disagreement and conflict. This will empower each of us to live in harmony with our highest values and ultimately lead to a smaller and smaller number of violent international conflicts among people and between nations. [24]

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[24] See **The Spirit of Project Management,** by Judy Neal and Alan Harpham (Gower 2012); "Spiritual Intelligence (SQ): the ultimate leadership 'tool'", by Max Langosco, 2012; and "An Awakening to a Higher Purpose," by Gregory Balestrero, 2012.

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APPENDIX A

General Comments of Peer Reviewers on Earlier Versions of this Report

Here are some general comments by some of our peer reviewers on the importance of bringing the concept of cognitive readiness into improving project team performance. To see the profiles of most of these authorities click on their names.

Gregory Balestrero: "*I think that PM work is long overdue to apply the principles of cognitive psychology…. some 60 years overdue. I say this to perhaps look at this report as a much needed, long overdue enabler of enhancing project performance. Cognitive science was explored in the 1930's…. EI research and applications is decades old. At the risk of sounding funny, you should position this as 'it is about damn time!' You four are presenting the breakthrough that others have neglected in spite of the research to the contrary.*"

Prof. Dr. Antonio Bassi: "*Compliments to the authors for the excellent work they have done. For years I have been highlighting the importance of the Cognitive Readiness for the project manager, but I didn't succeed in giving a shape to my thoughts. Finally this work gives me the possibility to do it. An essential point for the Cognitive Readiness is, certainly, the team formation, which supports the project manager in his growth and the introduction of some elements of psychology, certainly, could be helpful.*"

Lt. Col. Dr. Federico Fioravanti: "*So, I read with attention your words, and your aim, now, seem to me clearer. The awareness aspect by the Project Manager of the possibility of reducing the possible cognitive constraints by his team members is good. It sounds to me that this is the core issue and certainly the "core competence" on which we must focus. Very fascinating, and it sounds to me also that the "cognitive context" (accelerator plus constraint)… is worthy of experimental research, I dare say!*"

Prof. Dr. Stanislaw Gasik: "*First: probably I understood what you mean – the cognitive readiness concept is of crucial meaning for project management. Now perhaps I understand the difference between knowledge management, HR management and management of cognitive constraints. Second: You did a huge work reading all these papers with the goal of merging their content into the art of project management. One of the effects of this work is that the paper is – for me – rather difficult to read – there are many new, psychological and related concepts and almost no examples… which would enable myself in understanding details of the concept. Using your language – probably I am not cognitive ready for this paper: with emphasis on my lacking knowledge component (Figure 1). And I assess my motivation as sufficient.*"

Ing. Pier Luigi Guida: *The concept of Cognitive Readiness (CR) is certainly very fitting to the soft skills competencies of project management and should be given due attention and exploitation according to this and future researches. In particular we would consider CR as a means of managing uncertainties and other difficulties that could arise and should be overcome in project environment. Therefore in more complex (i.e. uncertain) projects this competence could be best put to use. Some training for project managers about this field should be therefore organized, implementing, say, the classical Tuckman model and other group facilitation techniques…. I would give my best appreciations and congratulations for the provided work.*

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Prof. Dr. Harold Kerzner: *The work you are attempting sounds interesting and I wish you luck in your investigations. Every project has its own unique characteristics. Some projects have profit margins and others are for internal use. Some projects are bid at a loss with the hope of generating future revenue streams with a particular client. Other projects are for various alignments to strategic plans and all of these projects are based upon different assumptions, constraints and risks. The skills of the labor force and their knowledge also play havoc with ROI calculations. Simply stated, the amount of assumptions that would have to be made to come up with a quantitative number makes the investigation almost impossible. Perhaps someone can come up with an approach to do it, but I cannot see how it can be done without looking at a finite (very small actually) sample where we are comparing apples and apples rather than apples and oranges. Although a company may be using the same project management approach for all of these projects, the concept of a quantifiable value as an outcome can cover an entire spectrum of results which may not be able to be easily explained.*

Prof. Federico Minelle: *"I found the outlined approach very useful, in perspective…. In my usual practice, while doing preliminary risk analysis, a basic checklist for evaluating team members' (and stakeholder families') positive/negative attitudes is already working. Your model, based on cognitive science, looks more thorough and disciplined, and therefore more promising, even in countermeasures design and implementation. I wonder whether a similar detailed approach can be easily applied to main stakeholder families (at least to project sponsors!), before starting the project.*

Prof. Dr. Darci Prado: *"The Cognitive Constraints approach is a good contribution to how to operate the Incubation Phase….. The inclusion of the COGNITIVE CONSTRAINT DIMENSION to measure PROJECT SUCCESS… is really an innovative and revolutionary idea. I think that a lot of work should be done for the acceptation of the idea in the practical world, but this is another story …."*

Bob Prieto: *"The concept of cognitive readiness as developed in this paper is directionally correct and extremely important…. This is a needed addition to the body of knowledge. It raises two questions which likely go beyond the scope of this report but which may be worth positing. The first, consistent with the PDRI [Project Development Readiness Index] concept [see Section 3.5 of the report], is whether a Cognitive Readiness Index may be constructed either as part of an expanded PDRI or alternatively as a stand-alone instrument. Second, can the change in cognitive readiness (ΔCR), be tracked on a real time or periodic basis, and act to serve as a leading indicator of team performance."*

Prof. Dr. Marco Sampietro: *"The report proposes a notable amount of new variables that project managers and team members should deal with. Some people will consider them as threats, some other as opportunities (depending on their cognitive constraints). The hard fact is that the human side of project management has to be taken more into consideration. As Jerry Madden, NASA, noted: 'The review of most failed projects or project problems indicate the disasters were well planned to happen from the start.' Well, I would say that many early signals of future disasters may be seen as deriving from cognitive constraints and poor cognitive integration between project actors. Another interesting area that the report underlines is that improving the human capital involved in a project is an additional and important project performance dimension since it creates the basis for future successful projects. In the logic of sustainable and long term development I think that this is fundamental."*

Miles Shepherd: *"I found this a most interesting paper."*

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Prof. Jorge Tarazona: *"About measuring the overall project success: I would suggest taking into account something about the compliance with the agreed standards and rules of the game, and contribution of the project to the enrichment of the Project Management Knowledge Base of the organization.*

Murray Woolf: *"Overall, I applaud the Concept, as well as the noble effort to advance the Concept to a larger audience."*

Shakir Zuberi: **"***I believe that publishing the thesis is half the battle and the other half will be finding Project Managers who fully understand what you presented and believe in your approaches and ideas and are willing to give it a try in the formulations of project teams. This may be an uphill battle.… During their professional careers many senior project managers may have used some of your concepts in their work in a fragmented way with some or limited success. The major value that I see of your work is that you are providing a frame to a number of relevant concepts and a one stop shopping for CR [Cognitive Readiness] to PM practitioners. I find it exciting…. I believe that the market of CR will be global and after a few real life applications and resulting refinement of your model, it will become a part of the evolving PMBOK in the near future. This by itself is a major success. The commitment that you are showing in converting CR from theory to practice and your personal belief that it will work will make PMs a major beneficiaries of your research. As a PM I would like to be the first to say THANK YOU!"*

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Definitions of terms and further reading on concepts and authors referenced in this report:

Cognitive psychology

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About the Authors

Russell D. Archibald: PhD (Hon) ESC-Lille (Fr), MSc (U of Texas) & BS (U of Missouri) Mechanical Engineering, PMP, Fellow PMI and Honorary Fellow APM/IPMA (member of the Board of IPMA/INTERNET 1974-83), held engineering and executive positions in aerospace, petroleum, telecommunications, and automotive industries in the USA, France, Mexico and Venezuela (1948-1982). Russ also had 9 years of active duty as a pilot officer with the U.S. Army Air Corps (1943-46) and as a Senior Pilot and Project Engineer with the U. S. Air Force (1951-58.) Since 1982 he has consulted to companies, agencies and development banks in 16 countries on 4 continents, and has taught project management principles and practices to thousands of managers and specialists around the world. He is co-author (with Shane Archibald) of **Leading and Managing Innovation: What Every Executive Team Must Know About Project, Program, and Portfolio Management** (2013); author of **Managing High-Technology Programs and Projects** (3rd Edition 2003), also published in Russian, Italian, and Chinese; other books (in English, Italian, Japanese, and Hungarian); and many papers on project management. Web-site: http://russarchibald.com   E-mail: russell_archibald@yahoo.com   LinkedIn: profile

Ivano Di Filippo: Certified PM and Member of Istituto Italiano di Project Management/ISIPM. *Member of Professional "Project management – Level 7" list held by ASSIREP.* Team leader of Genial Software, a high performance expert team. Ivano has over 20 years of experience as a consultant and project manager in business information and systems development. During three years of study with the medical faculty at La Sapienza University in Rome he developed a strong interest in subjects concerning human behavior and human mental processes, and has continued over many years to cultivate and develop this interest by applying the cognitive psychological theories as an important key to success in the numerous projects he has directed. Contemporarily he studied computer science to become a web site programmer and IT programmer as applied in project management. Ivano has 25 years with Radiotaxi 3570 Company, Rome, Italy, (the largest Radiotaxi company in Europe) and at present he is in charge of human resources in its Operations Control room. He is the author of "**When Does a Project Start? The Critical Buffering Theory**" in the Magazine "Il Project Manager" No. 8, 2011, published by Franco Angeli. Website: www.genialsoftware.it   Email: ivano.difilippo@genialsoftware.it   LinkedIn: profile

Daniele Di Filippo: Graduate Student at Roma Tre University (Rome, Italy) in Computer Engineering, he received his bachelor degree in July 2012, after having concluded an internship at NTT Data Company. Member of Istituto Italiano di Project Management/ISIPM. He participated in the InnovAction Lab 2013, where he further developed teamwork and business skills, including the challenges encountered in starting up new enterprises. He was part of the logistics management at Umap 2013 International Conference on User Modeling, Adaptation and Personalization. Daniele is currently studying for his Master Degree in Computer Engineering and his Thesis will focus on the design of software for Project Management Cognitive Readiness Standards to be used as a concrete tool within companies. He is involved in the Brain Activity Map Project, supported in Europe by the Human Brain Project/HBP, which aligns with the NIH BRAIN Initiative in the USA.
 Website: http://danieledifilippo.wordpress.com Email: daniele.difilippo@outlook.com LinkedIn: profile

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D. Di Filippo & S. Archibald

Featured Paper

Shane C. Archibald: BSc, Managing Principal, Archibald Associates llc. Shane has 20 years of experience in the development and implementation of advanced, integrated project management processes and systems on large complex projects and programs in several industries and governmental agencies. Most recently, he implemented the first phase of Project Controls applications and procedures for a large international heavy equipment design-manufacture-installation corporation, including advanced planning, scheduling, cost management, contract management, change management, and risk management processes. Co-author (with Russell Archibald) of **Leading and Managing Innovation: What Every Executive Team Must Know About Project, Program, and Portfolio Management** (2013). Previously Shane has:

- Developed and documented the project planning and control policies, processes and procedures for a US$10+ Billion transportation engineering & construction portfolio for one of the 50 United States, and managed the scheduling effort for that portfolio. Provided Subject Matter Expertise for a State-Wide Project Controls System Implementation.
- Managed the Project Controls Department for the Washington State Ferries, Terminal Engineering and Construction program, valued at US$1+ Billion.
- Managed the scheduling effort on a nation-wide US$4+ Billion telecommunication systems and facilities upgrade project.
- Managed the development process of a set of Web-based global enterprise products (shipping, pricing and logistics.)
- Implemented various project management and controls software applications and integration efforts, including several generations of Oracle Primavera systems.

Website: ArchibaldAssociates.com   Email: shane@archibaldassociates.com   LinkedIn: profile