Beyond The Iron Triangle: Year One [1]

By Andrea Caccamese[a]
and
Damiano Bragantini[b]

[a]*corso Vercelli 270E, Ivrea – TO 10015 Italy*
[b]*Agsm Distribuzione SpA, L.ge Galtarossa 8, Verona – VR 37132 Italy*

Abstract

Soft skills for the Project Manager have been traditionally identified as a set of cross-cutting skills that should complement the core job of establishing and maintaining reasonable tradeoffs among the elements of the traditional project management iron triangle. Soft skills have been put under the spot in the paper "Beyond the iron triangle: year zero", which, rather, identified in project management the presence of "soft factors" and associated "constrained soft spaces", among them the motivational space, the social ruling space and the analytic/holistic space. In that paper it was highlighted that the project manager needs to extend its integrative role also to "soft factors", so that the traditional "iron triangle" is modified into a "hard-soft pyramid", where "soft factors" are integrated into a constrained environment between themselves and with the traditional "hard factors", like scope, time, cost and quality.

Project management can rely upon handy tools for dealing with "hard factors": scope, time, cost and quality can be quantitatively defined and measured. But, what about "soft factors"? An integrative effort into "constrained soft spaces" needs similar tools to manipulate "soft factors".

This paper is the result of a research effort aiming to identify viable taxonomies for "soft factors" in project management, along with proxies representing their qualitative/quantitative values, either when demanded by the single individual in the project team, or when provided by the project.

The paper identifies "soft spaces" and the "soft factors" that expand into "constrained soft spaces". It provides a description of taxonomies for "soft factors", identifies proxies and metrics, and defines a simple process that might be put in place in any project context where the integrative project management effort is extended from "hard factors" to "soft factors".

Keywords: Human Resources Management; Constrained optimization; Soft Spaces

[1] *Second Editions are previously published papers that have continued relevance in today's project management world, or which were originally published in conference proceedings or in a language other than English. Original publication acknowledged; authors retain copyright. This paper was originally presented at the 27th IPMA World Congress in Dubrovnik, Croatia in October 2013. It is republished here with the permission of the authors.*

1. Background

In the last three decades the issue of what constitutes project success has been debated, and many efforts have been done to provide the project manager with tools and techniques useful to pursue project management success. At the beginning the effort was focused upon tools and techniques related to the "iron triangle", originally focused upon scope, quality, time and cost, and further integrated with tools and techniques focused upon uncertainty governance issues (Atkinson, 1999; Bernroider and Ivanov, 2011; Toor and Ogunlana, 2010).

Some steps ahead have been made in the direction to incorporate "soft" factors in the basis for project management success: "the project manager's leadership style influences project success" and "different leadership styles are appropriate for different types of project" (Turner and Muller, 2006, p. 30).

In 2012 has been postulated the existence of a soft pyramid (Figure 1), in which the management of "soft" factors in a constrained environment should complement the traditional effort of managing "hard" factors in a constrained environment (the "iron triangle"), and that this should be reflected appropriately in project management methods (Caccamese, Bragantini, 2012).

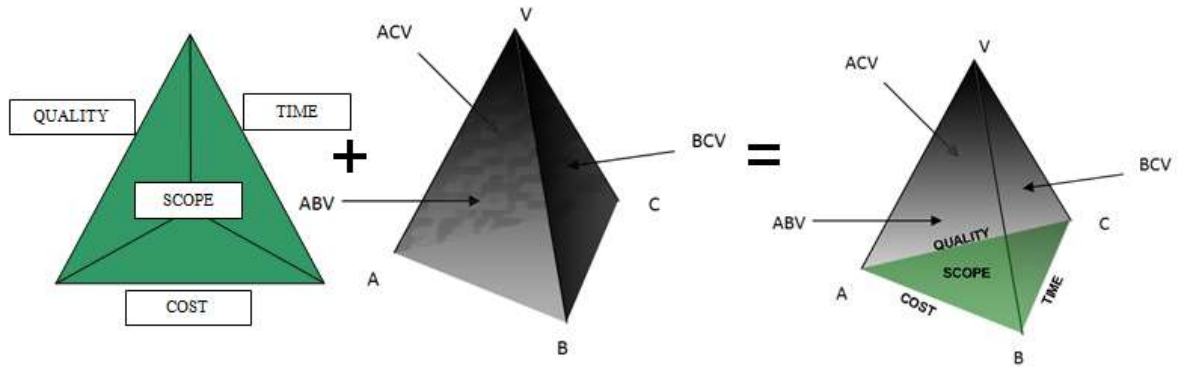

Fig. 1 - The soft pyramid

The "soft factors" establish for the project manager a further system of constraints.

Figure 1 depicts the "spaces for soft factors" as the interconnected faces of a triangular pyramid:

- ABV: motivational space. This is the space available for the project to activate the context for individual motivation. For example, like working conditions, job security, advancement, growth, power, affiliation, esteem, decision-making processes, rewarding systems (Verma, 1995);

- ACV: social space. This is the space available for the project to activate the protocols for acceptable behaviour. These are made of both task-related rules as well as social rules, like punctuality in task completion, agreed time to read and respond to messages, respect of consensus decisions, honesty, truth, preparation for and attendance to meetings, punctuality on meetings (Whatley, 2009);

- BCV: analytic/holistic space. This is the space available for the project to foster and facilitate the development of individual thinking models. The analytic model is centered upon

analysis, linearity, sequentiality, reductionism and places high value upon expansion, competition, quantity and assertiveness. The holistic model is centered upon synthesis, non linearity, parallelism, holism and places high value upon preservation, cooperation, quality and associationism (Capra, 1982).

Caccamese and Bragantini (2012) postulated that the traditional paradigm of project success must be revised complementing the activity of integrating and balancing "hard" factors with an activity of integrating and balancing "soft" factors, and "hard" factors with "soft" factors as well. In every project there is a "soft pyramid" that may have been built pragmatically and unconsciously through decisions, choices, and behaviours, often with a "lean" approach.

Good project management, in this view, is more than delivering in scope, time, quality and cost, rather it implies also the ability to manage a set of interrelated constraints, with the aim to create a project climate in which the various personalities working in the project may develop their own peculiarities in state of internal satisfaction.

A research focused upon the interaction of "allied disciplines" with project management (Table 1), highlights that organizational behaviour and human resource management show the highest potential of contribution to the improvement of project management discipline, and that project management methodologies need to include their contributions "to better understand the emerging and promising practices for future project endeavours" (Kwak and Anbari, 2009).

Table 1. Allied discipline with project management.

	AVAILABILITY		IMPACT	
ALLIED DISCIPLINE	**CURRENT**	**FUTURE**	**CURRENT**	**FUTURE**
OR/DS/OM/SCM	LOW	HIGH	LOW	LOW
OB/HR	**LOW**	**HIGH**	**LOW**	**HIGH**
IT/IS	LOW	HIGH	LOW	HIGH
TECH/INNOV/NPD/R&D	LOW	HIGH	LOW	HIGH
EC/CONTRACT/LEGAL	HIGH	LOW	HIGH	LOW
STRATEGY/PPM	LOW	HIGH	LOW	HIGH
PERFORM/EVM	LOW	HIGH	LOW	HIGH
QM/6SIGMA/PI	HIGH	LOW	HIGH	LOW

In the following paragraphs a taxonomy for each "soft space factor" will be proposed, and some proxies (where needed) and metrics will be identified for both the individual and the project environment.

2. The motivational space

2.1. Definition and taxonomy

The motivational space is defined as the quantity and kind of motivation available in the project environment.

From the latin word *motus*, motivation means "moving toward". Motivation is the set of forces acting upon an individual to activate his/her own energy to achieve something. Motivation is a recognized mean to inspire, encourage and stimulate team members and the team to achieve project success. Motivation is also conducive to an energetic spirit that can foster team work with the purpose to achieve common goals.

PMBOK® Guide (2012) defines motivation in project as "creating an environment to meet project objectives while providing maximum satisfaction related to what people value most".

Each team member brings in the project environment his/her own request for a certain amount of motivation of some kind, therefore making it possible to satisfy everyone's motivational demand is instrumental to achieve project success and a delivery of the project in line with the "iron triangle" approach.

Literature shows several models of motivation, besides the classical motivational models based upon motivational factors or decision-making paradigms, new tendencies show that motivation is hardly modeled as unitary phenomenon: extrinsic motivation (doing something because it leads to a specific outcome) needs to be integrated with intrinsic motivation (doing something because you are interested or simply you like) (Deci & Ryan, 2000). Research supports the idea that as far as motivation is concerned, each individual is driven by both extrinsic and intrinsic motivation (Boichè et al, 2008).

Intrinsic motivation comes from various sources, for example the desire to enhance personal knowledge, or to employ personal skills and abilities (Vallerand, 1997).

On the other side, extrinsic motivation is driven by external context factors, for example rewards or social acceptance.

Gagne and Deci (2005) state that intrinsic motivation moves individuals because they feel interest in what they are doing and satisfaction comes simply from the activity and not from its results. On the other side, extrinsic motivation moves individuals because of the tangible consequences of the activity, be they a praise, or tangible or intangible rewards.

There is not general consensus upon the existence and overlap of intrinsic and extrinsic motivation: Reiss (2004;2005) states that "human individuality may be too diverse to be described adequately in terms of global categories such as intrinsic and extrinsic motivation.": however Deci and Ryan model seems a valid reference to decompose and study the motivational space, according to the following taxonomy:

a) **challenge**, that means that the drive for movement stays in the originality and hardness of the activity to be performed. This element is typically present in research and development projects;

b) **reward**, that means that the drive for movement comes from the need that individual efforts or abilities are valued by some external subject, with either tangible (economical) or intangible (personal esteem) recognition factors;

c) **satisfaction/enjoyment,** that means that the drive for movement comes from the ability to display and show individual abilities or knowledge, to enhance personal competences and to take personal control of the activity.

In this taxonomy, challenge is mainly associated to the phenomenon of intrinsic motivation, with some elements of extrinsic motivation, reward is associated to the phenomenon of extrinsic motivation, satisfaction/enjoyment is associated to the phenomenon of intrinsic motivation.

2.2. Proxies and metrics

2.2.1. Individual

There is no need of identifying proxies for the three dimensions of individual motivational space: as far as the individual is concerned they may be identified and scored without any intermediate.

2.2.2. Project

Table 2 identifies the proxies for the three dimension of the project motivational space.

Table 2. Proxies for project motivational space

	Challenge	**Reward**	**Satisfaction/enjoyment**
Project	*Innovation*	*Rewarding system*	*Serendipity* *Learning* *Exploring*

a) **Challenge**

i. **Innovation.** Innovation is a proxy for the challenge in the project environment, in that the larger the level of innovation, the larger the amount of originality and hardness involved by the project tasks. Innovation may be defined and measured as the level at which the project environment fosters creativity and imagination for the development of new ideas based upon an existing process or product model;

b) **Reward**

i. **Rewarding system.** Rewarding system is a proxy for the rewarding in a project environment, in that more the project rewarding system is evident and structured, the larger is the space for reward in the project. Rewarding system in the project may be defined and measured by the existence of visible and structures recognitions in the project environment, be they either tangible (incentives, bonuses) or intangibles (praise, job security, recognition);

c) **Satisfaction/enjoyment**

i. **Serendipity.** Serendipity is a proxy for the satisfaction/enjoyment in a project environment, in that more opportunities for occasional discoveries in the project mean more space for satisfaction/enjoyment. Traditionally, serendipity discoveries are understood as accidental findings made when the discoverer is in quest for something else (Garcia, 2009)). Serendipity in the project may be

defined as the level at which the project allows to develop the attitude to discover something when looking for something else, a phenomenon that is very well exploited in scientific research. The more the opportunities in the project environment for accidental discoveries, the larger is the space for satisfaction/enjoyment or even "fun" involved by project tasks;

ii. **Learning.** Learning is a proxy for the satisfaction/enjoyment in the project environment, in that more opportunities for expanding personal knowledge in the project mean more space for satisfaction/enjoyment. "In today's work environment knowledge is a key asset, which is created by learning. As such, managers have an important obligation to cultivate and utilize it across projects. They need to investigate various tools to promote learning and inhibit forgetting. Since the main resource consumed in the execution of projects is often the skills of personnel, the focus should be on the assignment of personnel to teams and the assignment of individuals to tasks, in a way to promote learning" (Tukel, Rom, Kremic, 2008). Learning in the project may be defined as the ability for the project environment to make available opportunities for enhancing personal knowledge, for example through the exposure to Subject Matter Experts, or to regulatory and compliance constraints;

iii. **Exploring.** Exploring is a proxy for the satisfaction/enjoyment in the project environment, in that more opportunities for exploiting individual attitudes to investigation in the project mean more space for satisfaction/enjoyment. Exploring involves an individual effort to investigate and overcome individual weak points, as a starting point for individual knowledge expansion. Exploring for the project may be defined as the level at which the project environment allows individuals to try and test, to look outside their boxes.

3. The social space

3.1. Definition and taxonomy

The social space is defined as the set of social cohesion behaviours allowed in the project environment.

Literature shows that social cohesion behaviours have been investigated as being instrumental for team working and eventually for project success: "social interactions are just as important as carrying out the tasks of the project" (Whatley, 2009).

An understanding of social cohesion behaviours has been pointed out as being instrumental for an effective leadership: "a potent way to become a better leader is to find authentic contexts in which to learn the kinds of social behaviours that reinforce the brain's social circuitry" (Goleman and Boyatzis, 2008).

Even in classroom contexts, the importance of behavioural engagement has been pointed out as a success factor to promote student's active involvement in learning activities: "Classroom

engagement…is a multidimensional construct that consists of …for distinct, yet intercorrelated aspects: (a) on-task attention, effort and persistence (behavioural engagement)..” (Jang and Kim, 2012).

PMBOK® Guide (2012) identifies social cohesion behaviors as an important tool for fostering good team development: “Ground rules establish clear expectations regarding acceptable behavior by project team members […] Discussing ground rules […] allows team members to discover values that are important to one another”

Social cohesion behaviors report to many different classes, among them communicating, kind and depth of interpersonal relationships, promptness to handle messages and emails, punctuality to meetings, and many others.

For example, a project might mandate project rules that shortcut any permanent organizational structure and therefore make peer-to-peer communication in the project easy and independent from organizational rank and commercial relationships: this is the case where a project allows a large space for social cohesion behavior. Another example of a project that allows a large space for social cohesion behaviors is found when the project establish specific protocols for not leaving any e-mail or similar messages without answer in a specific time interval.

On the other side, when a project establishes communication protocols where communication with some agents in the project is explicitly mediated (through some sort of gate-keeper or similar communication protection methods), this is the case where the social cohesion behavior space allowed by the project environment is smaller. If there is no protocol enforcing to not leave unanswered messages in a specific time interval, this is another example of a project that allows a small space for social cohesion behaviors.

Each member joins the project team with a generally implicit need of performing some specific social organizational behavior, in that at a certain extent anyone may be more or less prone to social cohesion and may be more or less comfortable with a project environment that fosters or even enforces certain level of social cohesion.

Social cohesion behaviors have been studied and classified according to the concept of interrelated roles to achieve successful team working (Whatley, 2009). According to this classification, social cohesion behaviors are exploited in playing task roles, which include analysis, problem solving, decision-making, planning, design and build, and in playing maintenance roles, which refer to individual’s feelings and relationships between team members in team working.

Therefore, the social space (Whatley, 2009), may be divided into two separate, yet interacting, subspaces:

a) the “**task space**”, that is the social cohesion behaviors space concerned with project tasks execution, be they either technical tasks or management tasks;

b) the "**maintenance space**", that is the social cohesion behaviors space strictly related to individual socio-emotional attitudes that are integrated with project tasks execution.

3.2. Proxies and metrics

Table 3 identifies the proxies for the two dimensions of the individual and project social space:

Table 3. Proxies for project social space

	Task space	**Maintenance space**
Individual	*Inform of not completion*	*Face-to-face interaction*
	Punctuality in production	*Trust*
		Meeting attendance
Project	*Standards*	*Open communication channels*
	Work acceptance rules	*Punctuality at meetings*
		Messages feedback

3.2.1. Individual

a) **Inform of not completion**. Inform of not completion is a proxy for the social space in project environment, in that the more the individual values the need to keep others informed about difficulties to complete tasks in the assigned timeframe, the more his/her need for social behavioural cohesion is developed. The same holds as far as the expectation from others' behaviorin the same situation in expected. Attention or value given to this element in both directions is an indicator of the need of the individual to interact with others;

b) **Punctuality in production**. Punctuality in production is a proxy for the social space in project environment, in that the more the individual values the importance to complete tasks by the expected date, the more his/her need for social behavioural cohesion is developed. Synchronization of tasks in a project environment is for sure a target of a good project management practice, however the importance that individual attribute to the need of maintain their own activities in a strict pace with others' in the project is an indicator of the need of the individual to interact with others;

c) **Face-to-face interaction**. Face-to-face interaction is a proxy for the social space in project environment, in that the more the individual values a relationship based upon a direct and non-mediated interaction with others, the more his/her need for social behavioural cohesion is developed. High value given to face-to-face relationships, without filters either procedural, or organizational, or technical, is an indicator of the need of the individual to develop in the project context a good level of social interaction;

d) **Trust**. Trust is a proxy for the social space in project environment, in that the more the individual values the presence of trust in human and professional relationships, the more his/her need for social behavioural cohesion is developed. High level of expectations for trust in others is an indicator of the tendency of the individual to look for socialization in search of common objectives;

e) **Meeting attendance**. Meeting attendance is a proxy for the social space in project environment, in that the more the individual values the participation to meetings of diverse kinds, the more his/her need for social behavioural cohesion is developed. Individual giving limited importance to meetings attendance show an attitude to isolation and individual work, while high importance given to meetings attendance reveal the need of the individual to develop interpersonal relationships and a sound attitude to teamwork.

3.2.2. Project

a) **Standards**. Standards are a proxy for the social space in project environment, in that the more the project establishes (or plans to establish) reference standards for tasks and deliverables, the more space is offered for social behavioural cohesion. In the project context standards may be established and enforced under the form of naming conventions, requirements of conformance to specific industry characteristics. As long as more standards are defined and enforced, more commonality of behaviour and adherence to common values becomes part of project culture, and this means more opportunities for social interactions;

b) **Work Acceptance Rules.** Work acceptance rules are a proxy for the social space in project environment, in that the more the project establishes (or plan to establish) explicit protocols, procedures or rules governing the process of the acceptance of deliverables produced by the project micro tasks, the more space is offered for social behavioural cohesion. The number and the detail of acceptance rules are a good indicator of the sharing of a collective model of production, and this is turn means more opportunities for social interactions;

c) **Open communication channels.** Open communication channels are a proxy for the social space in project environment, in that the more the project establishes (or plans to establish**)** a communication plan which facilitates peer-to-peer communication among team members, the more space is offered for social behavioural cohesion. Open communication channels means that the information flow is not subject to procedural barriers (e.g. prescription of carbon copies in email), or organizational barriers as well (e.g. possibility to communicate directly with customers or suppliers without the prescriptive mediation of some actor of the project). As long as open communication channels are established, more opportunities are there for ideas exchange, opinion sharing, in sum more opportunities for social interactions;

d) **Punctuality at meetings.** Punctuality at meetings is a proxy for the social space in project environment, in that the more the project values the need for meetings to be attended and managed in respect of established timeframes, the more space is offered for

social behavioural cohesion. If the rewarding system of the project has considered any reward or punishment of any type for punctuality in meeting attendance and management, then the project has introduced an element of commonality in behaviour, an element of project culture, and an element of value for meeting attendance in terms of a reliable opportunity for establishing or maintaining social interactions;

e) **Messages feedback.** Messages feedback is a proxy for the social space in project environment, in that the more the project values the need to close the communication loop opened by any team member (may it be email, phone call, instant messaging), the more space is offered for social behavioural cohesion. If the project establishes, either formally or by common habit, that there is no specific timeframe by which a message needs to receive a feedback, then the communication between team members, even if effective, is not perceived as an opportunity for fostering social cohesion. On the other side, if some threshold for messages feedback is established, then communication is perceived as a reliable opportunity for establishing or maintaining social interactions.

4. The analytic/holistic space

4.1. Definition and taxonomy

The analytic/holistic space is defined as the set of individual behavioural attitudes toward analysis and synthesis.

The issue of individual tendencies oriented to the context versus individual tendencies oriented to the ego, rationality versus intuition, analysis versus synthesis, masculine versus feminine, yang versus yin have been for a long time addressed originally from the viewpoint of Chinese medicine (Porkert, 1974), which considered expansive whatever was connected with yang and conservative whatever was connected with yin.

Capra (1982) in his book examines how the combination of the two complementary tendencies in human nature may lead to a holistic vision of life.

Even physiologists have found that our brain is divided into two separate and communicating hemispheres, the right one devoted to intuition and synthesis, the left one devoted to rationality and analysis (Springer and Deutsch, 1993).

Salomon (1991) state that "*The analytic approach capitalizes on precision while the systematic approach capitalizes on authenticity*".

Gross and Jones (2004) question whether to consider analysis and synthesis as separates or couples have a sense. Barton and Haslett (2007) state that analytic processes attempt to explain how something works, while synthesis attempts to establish understanding of purpose.

A research (Dondana, 2010) on the kind of attitudes project managers employ when executing their tasks in a project environment, shows that there is a quite complex mix of approaches based upon analytical and holistic tendencies (Figure 2).

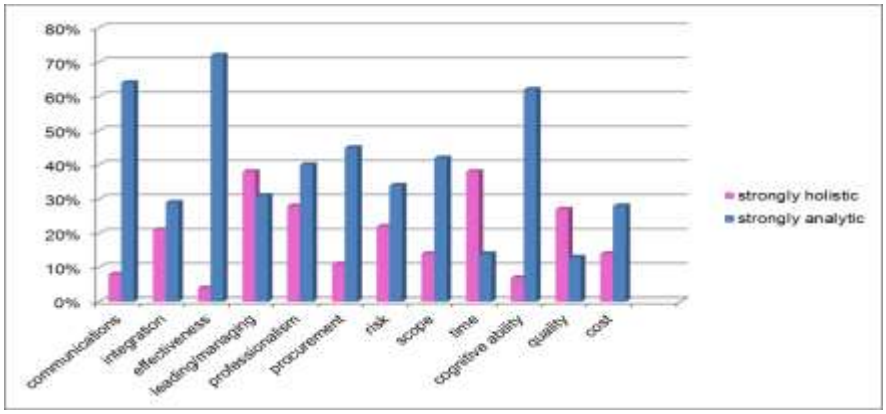

Fig. 2 – Distribution of attitudes in Project Management

As a matter of fact, each individual behaves according of a mix of two different attitudes, which might be defined the "analytic attitude" and the "holistic" attitude (Ackoff, 1981), which report to well defined classes of thinking models and values, as shown in Table 4.

Table 4. Analytic/Holistic Attitude

	Analytic	**Holistic**
Thinking model		
	Rational	Intuitive
	Analytic	Synthetic
	Reductionist	Holistic
	Linear	Not linear
Value		
	Expansion	Conservation
	Competition	Cooperation
	Quantity	Quality
	Domination	Associationism

Each individual is driven, with different levels of awareness, by specific thinking models or values which represent his/her own psychological profile, often an unbalanced mix of attitudes of the two kinds. For example, if someone is more apt to analyze, divide reduce, sequence a system into smaller parts, this shows an "analytic" attitude. On the other side, if someone is more apt to integrate, mix, take helicopter views of a system, general versus particular, gut versus brain, this shows a "holistic" attitude.

The project context might facilitate "analytic" or "holistic" tendencies based upon its own characteristics. For example, a "transformational" project that an organization runs with the

cooperation of several internal functions, based upon reuse or modification of existing components, might facilitate the application of "holistic" tendencies. On the other hand, a "commercial" project, that an organization runs to deliver to an "external" customer a complex product that is divided into separate parts to be built by different independent contractors, might facilitate the application of "analytic" tendencies.

In this view, the project offers a certain amount of analytic/holistic space to a set of consumers, the team members, each of them bringing into the project his/her own need for analytic/holistic space.

For the purposes of this paper, we will consider the taxonomy of analytic/holistic space shown in Table 5.

Table 5. Taxonomy of analytic/holistic spaces

	Analytic	**Holistic**
Thinking model		
	Analytic	Synthetic
Value		
	Expansion	Conservation
	Quantity	Quality

4.2. Proxies and metrics

4.2.1. Individual

There is no need of identifying proxies for the three dimensions of analytic/holistic space: as far as the individual is concerned they may be identified and scored without any intermediate

4.2.2. Project

Table 6 identifies the proxies for the three dimension of the project analytic/holistic space.

Table 6. Proxies for project analytic/holistic space.

	Analytic/Synthetic	**Expansion/Conservation**	**Quantity/Quality**
Project	*Amount of integration*	*Amount of reuse*	*Perceived value*

a) **Amount of integration**. Amount of integration is a proxy for the analytic/holistic space in project environment, in that the more the project product or process implies integration with external "systems", the more room is offered for holistic space and the less room is offered for analytic space. It seems reasonable that if a project implies a regime of integration with external systems, or with processes or products well established in an existing business, then a large space is left for the application of synthetic and holistic attitudes, or for their new development or reinforcement. If a project is self referential,

with little or no interference with external systems, with a single supplier, a single organization, then a large space is left for the application of reductionist and analytical attitudes, or for their new development or reinforcement;

b) **Amount of reuse.** Amount of reuse is a proxy for the analytic/holistic space in project environment, in that the more the project implies the reuse of product parts, production processes, methodologies or techniques, the more room is offered for the holistic space and the less room is offered for the analytic space. Reuse and innovation are not mutually exclusive, therefore a project might be new and innovative, as in the majority of cases, even in a context of deep reuse. On the other side, there might be a totally not innovative project in a context of poor reuse and development from scratch. If a project resorts to reuse of existing parts, processes, techniques, templates, then the project values conservation vs expansion, and the project context leaves a large space for the application of analytical attitudes, or for their new development or reinforcement. On the other hand, of the project does not resort very much to reuse of existing parts, processes, techniques, templates, then the project values expansion, and the project context leaves a large space for the application of holistic attitudes, or for their new development or reinforcement;

c) **Perceived value.** Perceived value of the project deliverable is a proxy for the analytic/holistic space in project environment, in that the more the deliverable of the project is valued according to its volume, the more room is offered for the analytic space and the less room is offered for the holistic space. For example, in a IT migration project the value of the deliverable of the project (in this case a set of business functions that have been moved from a initial IT system to a new IT system) is associated with "volumes", volumes of data moved one system to the other, volumes of records lost in the transition, volumes of increment of the rate of transactions per minute. This is the case in which "quantity" is essential in the project, therefore more room is offered to the analytic space and less room is offered to the holistic space. On the other side, in a Business Process Reengineering project the value of the deliverable of the project (in this case new business processes that replace existing business processes) is associated with qualitative attributes, "lean" processes, "easiness of use", "better look and feel". This is the case in which "quality" is essential in the project, therefore more room is offered to the holistic space and less room is offered to the analytic space.

5. Soft spaces capacity planning and control

So far, taxonomies have been defined for soft spaces, and a number of proxies to represent either the demand of the individual team member or the availability of the project environment have been provided.

Next step is to define an approach by which the soft space demand generated by individual team members is computed, the soft space availability of the project is computed as well, and the two are compared to determine whether the project can satisfy the needs of the project team. For the purposes of this paper, we will consider a simplifying approach by which the different dimensions of soft spaces, both for the individual and for the project environment, are

represented with numbers ranging in a simple numeric scale, as a result of interviewing or questionnaires.

Since the composition of the project team changes over time, and also the project environment might not be stable, this comparison needs to be reiterated with appropriate timing or in presence of specific contingencies (for example when a project phase ends and before entering the new phase, or when there is a major change in the project), to assess whether the project can still accommodate the needs of team members.

This capacity planning and control of soft spaces in the project is not philosophically different from what "monitoring and control" involves for "hard spaces" in the project, when periodically or in presence of specific contingencies the project manager needs to assess whether the project budget or allotted timeframe can still accommodate the estimate to complete.

5.1. Combination of dimensions of soft spaces

Taxonomies for the soft spaces are a valid tool to decompose the problem of measuring "motivation", "social cohesion" and "analytic/holistic" either in the demand from a team member, or in the offer from the project environment. The question is, now what is the combinatory algorithm by which the different dimensions in which the soft spaces have been decomposed contribute to build up a single "offer" or "demand" value? For example, how to compare a motivational request related to "challenge", with a motivational request related to "reward" or with a motivational request related to "satisfaction/enjoyment"? And the question in turn resurfaces when the "proxies" that build up a single value of a dimension of soft space demand or offer are considered.

For example, how to compare the different ratings for the three proxies of project satisfaction/enjoyment, namely serendipity, learning and discovering? This is outside the scope of this study, and perhaps only an application of the model to several diverse projects in a specific organization might produce a definite answer.

This paper assumes the simplifying hypothesis that the dimensions of the taxonomy of soft spaces are idempotent, and that all values collected for each element of the taxonomy are idempotent as well.

5.2. Project amplification factor (PAF)

Using the same numeric scale for soft space demand and offer raises the question how to make a comparison. For example, how to compare a "177" demanded value of motivational space as a result of the summation of the demand of all team members in the project, with a "17" value of available motivational space as a result of the characteristics of the project context? Does this mean that the project motivational space offer cannot accommodate the motivational space demand? A factor, that is defined Project Amplification Factor (PAF), needs to be defined to recalibrate the values of soft space offer versus the values of soft space demand.

At a first glance, "project complexity" seems a good starting point to identify the project amplification factor. Literature shows great interest for project complexity and some taxonomies have been proposed.

For example Cicmil and Marshall (2005) for the construction industry propose the following taxonomy for project complexity:

1. complex processes of communicative and power relating among project actors;
2. ambiguity and equivocality related to project performance criteria (success/failure) over time
3. the consequence of time flux (change, unpredictability and the paradox of control).

Sinha et al. (2006) proposes the following three complexity justifying factors, namely:

1. the workers;
2. material; and
3. tools used in carrying out the project activity.

It is difficult to define what complexity really means. There are many definitions of complexity in literature.

A couple of them are:

1. Complexity is being marked by an involvement of many parts, aspects, details, notions, and necessitating earnest study or examination to understand or cope with (Webster's Third International Dictionary, Gove 1986).

2. Complexity arises from not only the size of the system but also from the interrelationships of the system components and the emergent behaviour that cannot be predicted from the individual system components (Arteta and Giachetti 2004).

There are also other dimensions of complexity. According to Reiss (1993), four significant dimensions can be identified that drive complexity:

1. size (number)
2. diversity
3. variety
4. uncertainty.

Deriving PAF from project complexity theory seems attractive, but it is outside the scope of this paper. However, some of the elements of project complexity theories point out that complexity is somewhat linked with "volume" of the project, and heuristically it seems reasonable to derive PAF from the value of some tangible characteristics of the project: the longer the duration (D), the bigger the budget (B), the higher the number of communication channels (C), the more the project offer of soft spaces can accommodate the soft spaces demand. The importance of the

number of communication channels appears reasonably prevalent upon duration and budget of the project, therefore the following is proposed as a formula for the project amplification factor (PAF):

$$PAF=D*0.25+B*0.25+C*0.5$$

where D and B vary in a numeric qualitative range, C is a value derived from the number of communication channels in the project deriving from the calculation C=(n*(n-1)/2)*r, where n is the number of active project team members and r is a reduction factor, which varies with the number of team members according to Figure 3. The definition of the numeric qualitative range for the variation of D, B, r and the associated metrics should be subject to validation and calibration, and this is for sure a topic for further research and work.

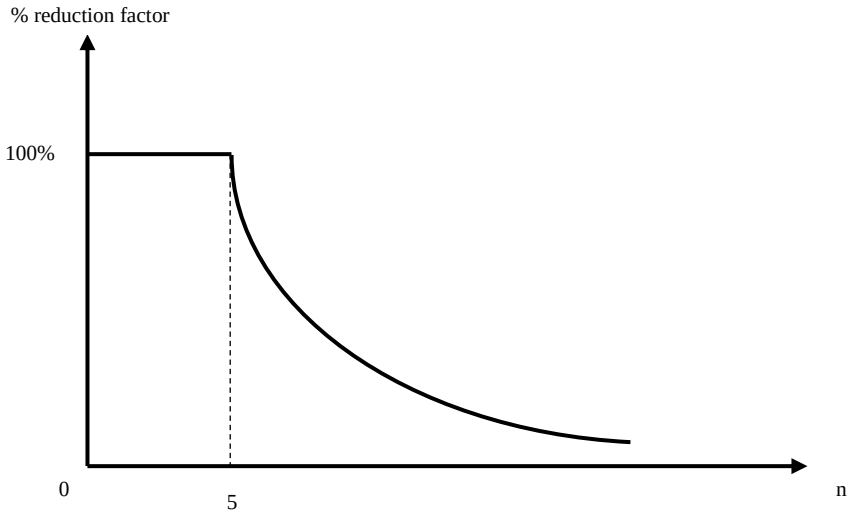

Fig. 3 – r reduction factor

5.3. Put it at work

The following are few steps that might be put at work execute the capacity planning of soft spaces:

1. calculate the soft space offer from the project, according to the defined taxonomies and proxies. It is very important that the viewpoint of all project stakeholders is taken into consideration, therefore using some sort of questionnaire would be helpful. The calculation could involve the project as a whole if there is no perceived difference in the characteristics of the project environment throughout its life cycle. However, it could be executed for different time frames of the project life cycle, for example with reference to the phases in which the project is divided, when it is expected that the project context, in terms of soft space offer, changes from one phase to the other;

2. for each team member, calculate the soft space demand, according to the defined taxonomies and proxies. These values are not expected to change during the project life cycle, since they are intrinsic of the individual and the duration of the project is short in comparison to the time needed by an individual to modify his/her individual request of soft space. To reach a normalized view of data, the usage of some questionnaire is strongly recommended;

3. having available the scheduled presence of team members in the project, sum up the calculated demand values for team member for periods of work;

4. compare these calculations to get an idea whether the project soft space offer can accommodate the cumulated team members' soft space demand and in which periods of work. If there is an overload of request of demand (lack of capacity), this is an input for corrections, that might involve for example considering to change team members. Alternatively, the project manager can increase the offer of the project for one or more soft spaces, or level resources to obtain the right demand of soft spaces. No surprise that any change made to accommodate capacity and demand of soft spaces might have an influence to an already established baseline of hard spaces. For example, levelling resources to accommodate for soft spaces, might involve increasing the duration of the project. This is a further effort in overall project planning that should be integrated also from the methodological point of view (Caccamese, Bragantini, 2012). Note that, other from capacity planning for "hard factors" (like cost or time), lack of capacity does not mean that the project will fail to deliver on time and on budget, rather that the project will fail to provide team member with what they are looking for. The result of this should not be underestimated: disappointed team members are likely to be less productive, less oriented to quality, and eventually more oriented to leave the organization;

5. repeat steps above at regular intervals of time or whenever contingencies of the project might require (for example when a project phase ends and before entering the new phase, or when there is a major change in the project), to assess whether the project can still accommodate the needs of team members. This is a further effort in project monitoring and control that should be integrated also from the methodological point of view (Caccamese, Bragantini, 2012).

6. Examples

Based upon the methodology described, some preliminary examples of reports for soft space capacity planning and control in case study projects are shown in the following. Figure 4 shows a project where the project team is allocated flat either for the entire project or for a portion of the project life cycle (for example, a phase): in this example the offer largely exceeds demand for all the soft spaces, then no intervention is needed.

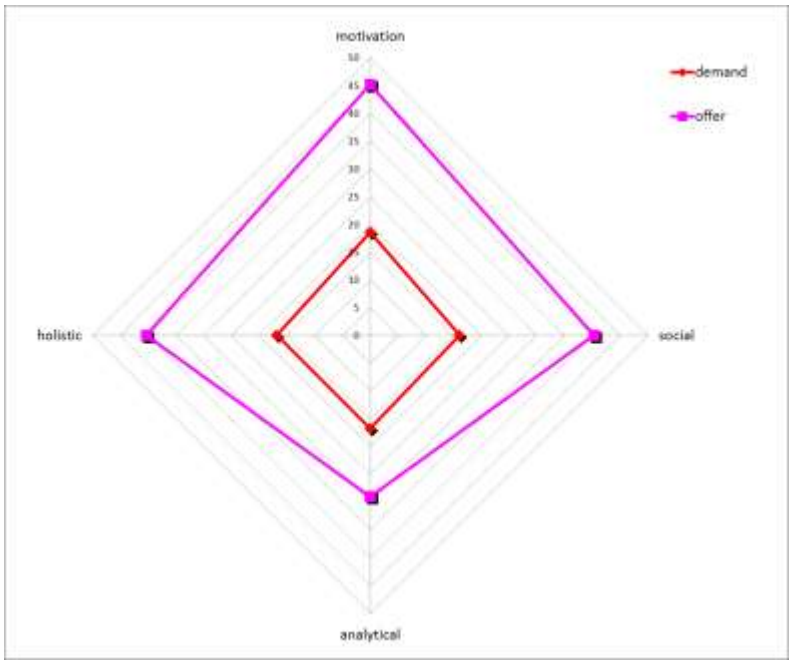

Fig. 4 – Balanced Project

Figure 5 shows a project where the project team is allocated flat either for the entire project or for a portion of the project life cycle (for example, a phase): in this example demand for motivation exceeds project capacity, then some intervention would be needed.

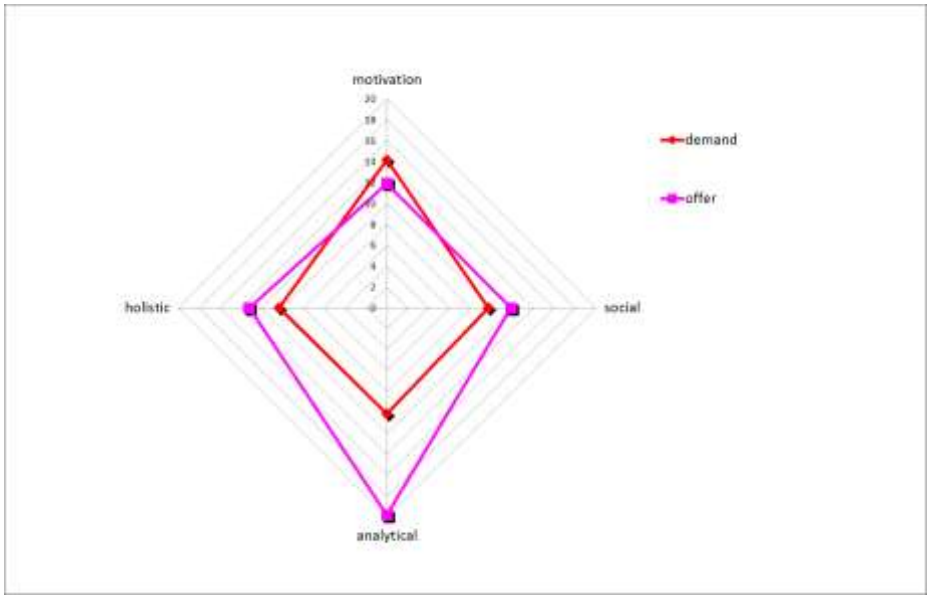

Fig. 5 – Not Balanced Project

The examples of Figure 6, 7, 8 assume that the project team is made of individuals whose allocation varies period by period, for example inside a phase of the project. In this example, the level of cumulated demand for a specific soft space would be compared with the flat value of offer for soft space for the same period of time.

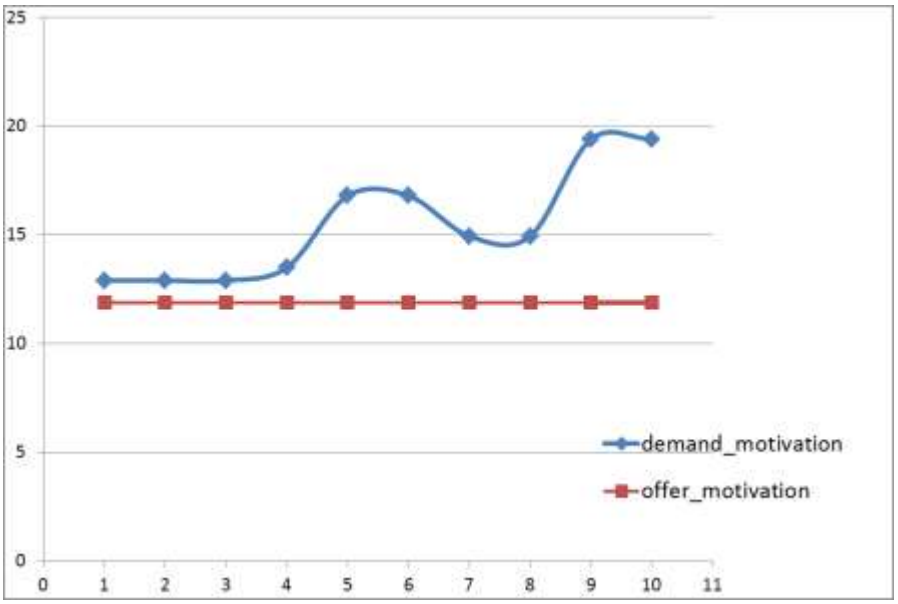

Fig. 6 – Not balanced Project – Phase 1 - daily details

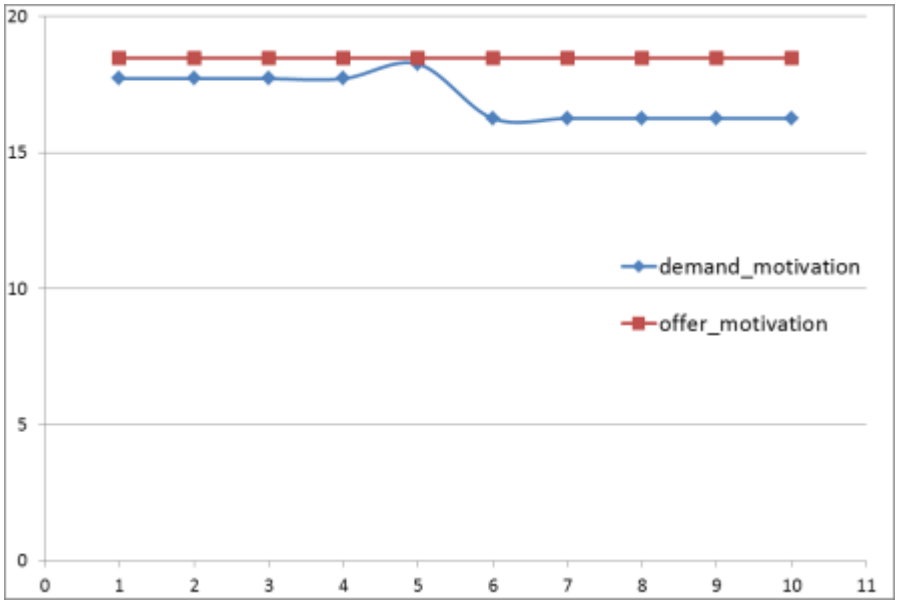

Fig. 7 – Balanced Project – Phase 2 - daily details

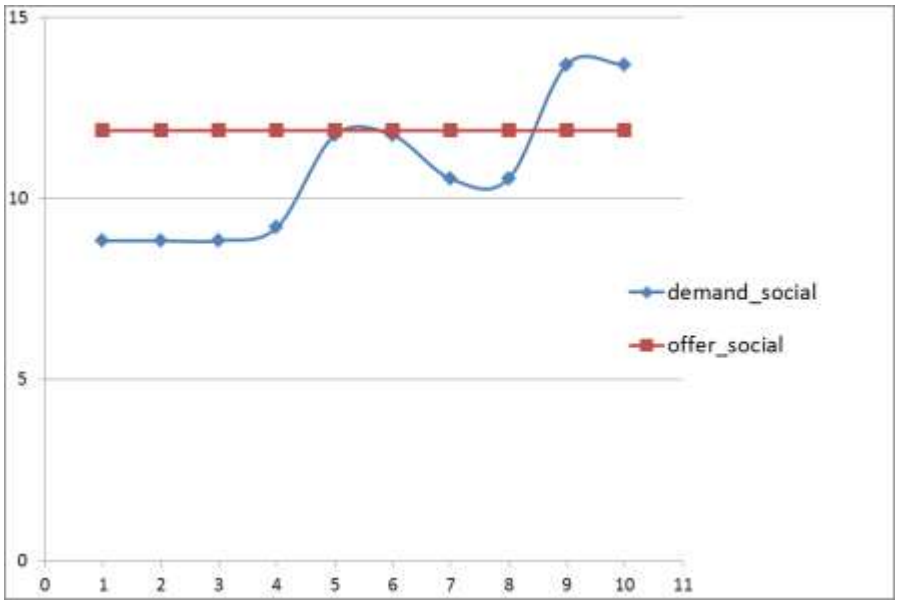

Fig. 8 – Not balanced Project – Phase 1 - daily details

7. Conclusions

To explain the phenomenon of project success Caccamese and Bragantini (2012) argued that the management of "soft" factors in a constrained environment (the "soft pyramid") should complement the traditional effort of managing "hard" factors in a constrained environment (the "iron triangle"), and that this should be reflected appropriately in project management methods.

In this paper the authors presented an approach to quantitatively deal with soft factors and to establish some sort of "soft factors" capacity planning and control.

The project manager should be able to properly balance the project, extending his/her approach to balanced and constrained optimization of "hard factors", to "soft factors" as well.

Further applied research is needed in the future to validate the many hypothesis made on taxonomies and proxies, to determine the most appropriate value of PAF, to put in place and calibrate appropriate metrics, and eventually to integrate the model with some of the most popular project management tools.

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About the Authors

Andrea Caccamese

Italy

Andrea Caccamese is an Electronic Engineer with more than 30 years of work experience in Information Technology and in Management Consulting for Banking, Finance, Insurance, Oil, Manufacturing, Defense, Software Development and Hardware Manufacturing sectors. Currently he is an independent Project Management Consultant and Trainer. Mr. Caccamese has gained extensive experience in Program and Project Management, working for or with large organizations or Customers from Banking, Finance, Insurance and Manufacturing, being the leader of several relevant Programs and Projects.

Andrea Caccamese is a certified Project Management Professional (PMP) from Project Management Institute (PMI). He is also a certified PRINCE2 Practitioner and ITIL V3 Foundation Certified. He has been actively involved with Project Management Institute (PMI) in the development of the standard for OPM3 (Organizational Project Management Maturity Model) Second Edition as a Sub-Team Leader, as a final Exposure Draft Reviewer and Contributor of PMBOK Fourth Edition, and as an Internal reviewer and final Exposure Draft Reviewer of PMBOK Fifth Edition. He has also been actively involved and is still involved with the local PMI Northern Italy Chapter, where he has been a contributor to some research projects. Mr. Caccamese is a frequent contributor and speaker at various Project Management events and is co-author of the preparatory text book for PMP Certification examination “Professione Project Manager”, and co-author of the text “*Il ruolo del Project Manager*”. Andrea Caccamese can be reached at andrea.caccamese@libero.it

Damiano Bragantini

Italy

Damiano Bragantini is a Civil Engineer with more 15 years of experience in Civil Infrastructure and Information Technology experience. Currently he is working with Agsm Group, an important Italian utility in generation, distribution and supply of electricity and gas. Mr. Bragantini is also a recognized teacher at the University of Liverpool (UK) where he teaches in project management MSc.

Mr. Bragantini is a certified Project Management Professional (PMP) from the Project Management Institute (PMI). He has been also actively involved with Project Management Institute (PMI) as a final Exposure Draft Reviewer for Project Cost Estimating Standard and Practice Standard for Earned Value and as internal reviewer of PMBOK Fifth Edition. Mr.Bragantini has also been actively involved and is still involved with the local PMI Northern Italy Chapter, where he has been a contributor to some projects. Damiano Bragantini can be contacted at damiano.bragantini@agsm.it.