

## **AC 2008-1552: A TEAM LEADER SELECTION PROCESS FOR PROJECT-BASED LEARNING EXPERIENCES**

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# A Team Leader Selection Process for Project-Based Learning Experiences

## Abstract

First-year chemical engineering students at the University Rovira i Virgili (Tarragona, Spain) carry out an integrated design project organized in teams. This project lasts two successive fifteen-week periods and all of the first-year courses participate actively in it, hence the adjective integrated. The goal of this project is that first-year students learn by themselves certain contents of each first-year course and that they apply this knowledge to solve several design problems that may be posed when designing a specific chemical plant. Project teams must also identify and define these design problems taking into account first-year instructors' requirements. To help first-year project teams cope with this challenging experience, project teams are led and managed by fourth-year students who are enrolled in the fourth-year Project Management in Practice (PMP) course. Leadership is a key component for the success of any team and consequently the selection of first-year project team leaders is a key process of the PMP course. The selection process has been designed to select about a dozen students, which represents about one third of PMP's students, who have the highest potential to lead and manage a project team and who are willing to do so. The selection process is structured in three main steps: (1) *pre-selection*: academic qualification and motivation to be a leader, (2) *screening*: personality profile, (3) *selection*: demonstration of the leadership competence. In the first step, all students enrolled in the PMP course have to fill out a short form to check their academic eligibility for the position and their motivation to be a leader. In the second step, all PMP's students are asked to complete three psychometric tests: Belbin's Team Role Inventory, Myers-Briggs Inventory, and Leadership Style Inventory. The analysis of the results obtained from steps one and two using a set of research-based criteria yields a list of candidates. Finally, PMP's instructors conduct behaviour-based interviews to all candidates to validate test findings and assess their level of leadership competence to ensure that the best candidates are chosen for the position.

## 1. Introduction

The School of Chemical Engineering at the University of Rovira I Virgili (Tarragona, Spain) deploys an Integrated Design Project (IDP) approach in which first and fourth year courses are horizontally and vertically integrated<sup>1</sup>. This 1<sup>st</sup>-4<sup>th</sup> year IDP approach integrates all first year courses horizontally into a design project by which first year students are teamed up and challenged to design a specific chemical plant or product by applying the theoretical knowledge from first-year courses. First-year teams work during two consecutive fifteen-week periods towards the development and accomplishment of the design project consistent with the requirements of clients; first-year course instructors.

To help first year students manage this challenging project, part of the fourth year students who are enrolled to Project Management in Practice (PMP) course are selected to take on the leader role of first-year project teams. PMP course, offered annually, places premium on the development of leadership competence of fourth-year

engineering students. In this context, selection of team leaders was of prime importance to both first year project teams and to PMP course itself.

Speaking in terms of first-year teams, the role of the student leader is undoubtedly very important. A large and growing body of research considers leadership as one of the key determinants of team effectiveness and team success<sup>2-4</sup> due to the important role the leader plays in target setting, steering the group dynamics in the right direction<sup>5</sup>, resolving conflicts and keeping the team on track<sup>6</sup> and facilitating team process<sup>7</sup>. It has been further argued that leadership should be considered as the *most important factor* affecting team effectiveness<sup>8</sup>. With that being said, one may comprehend how effective and healthy functioning of first-year teams might be jeopardized by a fourth year leader's failure in leading the team.

Another reason why the leader role is considered to be important in the 1<sup>st</sup>-4<sup>th</sup> year project is the potential impact of the leader on first year students' development. Previous studies have reported that leadership impacts the development of followers<sup>9, 10</sup>; therefore first year students' development might be affected by the fourth-year leader students. Needless to say one other important role of the fourth-year leader is to role model the system. From a vicarious learning perspective, defined as learning based on observation of others' behavior<sup>10</sup>, it is probable that first year students imitate their leaders and start to behave like them. This point emphasizes that a fourth-year leader student may have an effect in shaping the development of future leaders'; first year students.

The decision of which student should become the team leader is equally important for the dynamics of the PMP course also. Leader development is a focal point in PMP course and one clear implication is the need to identify those students who have a potential to take the leader role and learn it over time.

For the above mentioned reasons designating a student as the team leader is not easy and definitely should not be done in a haphazard manner. This paper presents a methodical selection process for the concise identification of students' leadership potential. The paper first gives a brief overview of the PMP course and continues with the theoretical frame on which the leader selection process is based. The last section explains how this selection process is implemented into PMP course in 2007-2008 academic year.

## **2. Project Management in Practice Course (PMP):**

Project Management in Practice (PMP) has been designed and presented as an elective course aimed at enhancing fourth-year students' competence in leadership and skills in project management and facilitation. In this course students may become the *leaders* of first-year project-teams. Number of leadership positions in PMP course is limited and generally only one third of the PMP students can actually take on the leader role. The students who want to become the leader have to undergo a selection process before they are eligible to lead first-year project teams. Through the selection process explained in this paper, the students with the highest potential and adequate desire to lead are identified and selected as the leaders. The remaining of the students, who are not willing to become a leader and who are not selected as leaders, participate in various fourth year project teams. In those teams, students might choose to work in one of pre-determined

projects (i.e. developing a competency-based evaluation methodology for other departments) or they might as well propose project (i.e. designing a cafeteria management system for the university campus).

The selected leaders help first-year students to solve design problems concerning a given manufacturing process. This process has to produce a particular final product, for example nitric acid, or to transform a specific raw material, for example grapes, into different final products. In the latter case each project team must produce a different final product. The responsibilities of the team leader involve leading change, building the team and managing the project. Table 1 summarizes the role of the first-year team leader and the duties and responsibilities associated with that role.

**Table 1:** The role of a first-year team leader and the associated responsibilities, and duties

<b>Description of Role:</b> Team Leader will be responsible for the development of teams which effectively meet needs, achieve goals and manage the way in which they work. The Team Leader, leading primarily from a position of power, will act as a role model to teams, helping them to build relationships, adopt methodologies and gain the knowledge and skills needed to accept greater levels of responsibility over time and increase performance.	
<b>Responsibilities</b>	
<b>Leads Change</b>	<ul style="list-style-type: none"> <li>○ Sees and explains the big picture.</li> <li>○ Defines a purpose for the team, envisions future success (goals, targets) and a path to follow.</li> <li>○ Motivates and inspires team members and becomes a role model for leadership and teamwork.</li> <li>○ Handles fear to change of members.</li> </ul>
<b>Builds the Team</b>	<ul style="list-style-type: none"> <li>○ Investigates the capacities of the team and its individual members and encourages them to improve continuously.</li> <li>○ Is responsible for the team charter (clients, stakeholders' needs and requirements, team norms, project scope, time schedule, product definition, communication processes, etc.).</li> </ul>
<b>Manages the Project</b>	<ul style="list-style-type: none"> <li>○ Monitors process execution and manages changes in the planning.</li> <li>○ Assesses team members to improve performance (gives continuous feedback and quantitative performance appraisal to team members, applies balance of consequences).</li> <li>○ Handles conflicts and facilitates constructive conflict resolution.</li> <li>○ Manages meetings and coordinates activities.</li> <li>○ Is responsible for the close-out report.</li> </ul>

To help leader students acquire and develop leadership competence, PMP course provides students with the formal training, experiential learning (being the leader of first-year teams) and coaching processes that are relevant and central in leadership development. Formal training, done through in-class teaching, equips students with the key concepts relevant to leadership, project management, and facilitation techniques and tools (2 hours/week). Formal meetings with first-year teams (1 hour/week) enable students to experience and apply those concepts that are thought in the class. Each leader student is formally and individually coached at least twenty minutes.

### 3. Theoretical Model

#### 3.1. Background Information

This section presents the underlying theory on which the *leadership selection process* is based. Recent research regarding leadership development has heightened the importance of evaluating the potential of candidates for leadership positions<sup>10</sup>. This evaluation is required to spot people who will succeed in a leadership role. In order to make such prediction, however, it is essential to identify key dimensions associated with leadership effectiveness; in turn the leadership potential. So far, however, no single dimension has been reported as to be making the sole contribution to leadership potential. Various dimensions have been suggested by different researchers as to be predictive of leadership success. Our review of relevant literature identified the following dimensions as being *highly* related to leadership potential:

- motivation to lead,
- personality preference, and
- leadership competence

The above mentioned dimensions therefore constitute the basis for the construction of the leader selection process presented in the paper. The following paragraphs present the importance of including aforesaid dimensions in the evaluation process of leadership potential.

- *Motivation to lead*: Motivation to lead is defined as “*a construct that affects a leader-to-be’s decision to assume leadership roles and responsibilities and that affect his or her intensity of effort at leading and persistence as a leader*”<sup>11</sup>. This dimension is particularly important in identification of leadership potential because an individual would not become a leader without this motivation<sup>10, 12</sup>. For a fourth-year student leader to succeed, it is important that he or she be ready to take on this responsibility and has the adequate motivation to do so. If the fourth year student is not willing to become a leader, the leadership training and experience provided in the PMP course would be unworthy as these students will not practice them. Therefore selection should relate to the question of motivation.
- *Personality Preferences*: The issue of personality has been an intriguing subject in the field of leadership for some time now. A substantial body of research has been devoted to identify the possible linkages between personality and leadership<sup>12, 13-17</sup>. Evidence from these studies demonstrated that personality variable can be used to determine who is likely to emerge as a leader, exercise effective leadership<sup>13-14</sup>, to learn and develop it over time<sup>12</sup>. Just as there are personality preferences associated with effective leadership, there are also other individual differences and qualities that may cause failure in leading<sup>18</sup>. Also there are personality types that tend to avoid leadership roles and may experience considerable discomfort when forced into such roles<sup>19</sup>. Therefore, personality type should be strongly considered when selecting a team leader<sup>6</sup>. Personality identification not only allows PMP course instructors to identify the candidates who possess adequate personality dispositions as required by the leader role but also it helps us to position the students to the roles that they would feel themselves most comfortable with. In doing so, any negative outcomes consequent to student misplacement would be prevented.

- *Leadership Competence*: Leadership is a competence cluster and contain several competences that when applied appropriately result in desired outcomes in relation to leadership. Based on the Fundamental Concepts of Excellence of the EFQM Excellence Model<sup>20</sup> eight competences have been identified to be related to effective leadership: integrity, initiative, drive for excellence, responsiveness to change, commitment for learning, teamwork, service, and interpersonal communication.

In addition to the dimensions stated above, *academical eligibility* has been also considered as relevant for fourth-year students' effectiveness in leadership. Since the design project involves the application of the theoretical concepts from first-year courses, a fourth-year student who failed first year courses may not be able to guide the teams in an effective manner. It has been also considered that a leader with pending courses from first-year may not also seem so trustworthy to first-year students. Therefore, a fourth dimension, academical eligibility, has been included as relevant for evaluating fourth-year students' leadership potential.

Consequently, it was decided to look for the demonstration of academical eligibility, motivation to lead, personality preference, and leadership competence when choosing the team leader. This multi-facet approach for the leader selection covers the relevant dimensions deemed important for the leadership potential which in turn allows the identification of leadership potential in a concise, clear and objective manner. Therefore this selection ensures that;

- The first-year project teams are lead by those students who have the *highest potential* to do so. It eliminates any possible criticism of choosing the leaders depending solely on one factor like their academical achievement, personality, or such.
- The return on leadership development investment would be high for the PMP course. In other words, this selection identifies the students in whom should the leadership development efforts be invested. Because it is harder to build and strengthen the leadership in those individuals who lack that potential, it requires the investment of a great deal of time and experience to do so.
- The students are placed into the roles that they would feel themselves most comfortable in assuming and fulfilling.

That being said, it is now necessary to explain how aforesaid dimensions are measured throughout the selection process. The following section provides an understanding of the application of instruments and techniques in identifying each one of the dimensions.

### 3.2. Measuring Leadership Potential

*Academical Eligibility*: The necessary condition for being academically eligible is that the fourth year student should have approved all the first-year courses. Since academical

achievement records are considered as confidential information, it was not possible to reach this sort of information by obtaining record of achievement from the student affairs department. Therefore, it was decided to ask students directly if they have approved the first-year courses through the use of a survey.

*Motivation to Lead:* Though there are several types of surveys used for the investigation of the construct of motivation to lead, it was not our intent to identify the underlying constructs of motivation. It was our concern if the students would like to take on the leader role of first-year project teams. For this reason it was decided to ask students one very concrete question “*Would you like to become one of the leaders of first-year teams?*”

*Leadership Competence:* The interview method of assessing competencies has been widely accepted<sup>21</sup>. *Behavioral Event Interviews (BEI)* technique was chosen as a technique to assess students’ level of leadership competence. The basic principle of competency approach is that what people think or say about their motives or skills is not credible. Only what they actually do, in the most critical incidents they have faced, is to be believed<sup>22</sup>. Therefore, the objective of BEI is to get very detailed behavioral descriptions of how a person goes about doing his/her work<sup>22</sup>. The questions are based on real situations and the interviewee is asked to describe the specific behaviors, thoughts, and actions s/he has shown in real critical situations. An example BEI question is; “Describe a time when, against all odds, you were able to get a project or task completed within the defined parameters.”<sup>23</sup>

*Personality Preferences:* Psychometric tests have been found to be valid predictors for performance and it has been stated that failure to employ them in selection lead to economical losses<sup>24</sup>. To identify the individuals who possess sufficient personality traits salient to leadership three psychometric tests have been administered to the students who are enrolled to the PMP course: *Myers-Briggs Inventory, Belbin’s Team Role Inventory, Leadership Style Inventory*. The next section provides a theoretical understanding of the psychometric tests that are used to determine the personality preferences of a leader.

### 3.3 Psychometric Tests

This section provides an understanding of the theoretical and research history behind the psychometric tests being used in the identification of leader-linked personality preferences.

#### 3.3.1 Myers-Briggs Type Inventory (MBTI)

Myers-Briggs Type Inventory (MBTI) is credited as being the world’s best-known and most widely used personality inventory<sup>25</sup> and has been found to be useful in identifying leadership styles<sup>26</sup>. Based on Jung’s work, MBTI assesses personality types and preferences in terms of four scales with two opposing preferences in each scale;

Focus of Attention:

- *Extrovert (E):* Energized by interacting with others and taking action, thinks out loud, are sociable and expressive.
- *Introvert (I):* Draw energy and renewal from time alone, thinks best when alone, can be seen as private and contained.

Information Take-in:

- *Sensing (S)*: Focus on present realities, prefer the factual and concrete, takes in discrete information at a time.
- *iNtuitive (N)*: Focus on future possibilities, imaginative and creative, takes in great, undifferentiated chunks of information.

Decision Making:

- *Thinking (T)*: Analytical, use cause and effect reasoning, solves problem with logic, use their heads.
- *Feeling (F)*: Empathetic, are guided by personal values, strive for harmony, use their hearths.

Relationship with the Outer World:

- *Judging (J)*: Tend to act decisively, to emphasize planning, time frames, and task completion.
- *Perceiving (P)*: Flexible, spontaneous, and enthusiastic. Prefers the open-ended.

The combinations of the four types produce 16 different personality types. An individual typed as an ISTJ, for example, would exhibit preferences for introversion, sensing, thinking and judging.

It is worth to note that different types are attracted by different careers<sup>27</sup>. For example, ESTJ is a predominant preference in managerial roles<sup>19</sup>. Our attention was drawn to high percentage of TJs (85%) in top-level executives and it was asserted that “a preference for T alone is not enough it needs to be *extraverted thinking* for progression in organizational ladder”<sup>28</sup>. Furthermore, it was argued that life’s natural administrators are the *ESTJs* while life’s natural leaders are the *ENTJs*<sup>29</sup>. In a similar vein, ESTJ has been proposed as a preference for leaders<sup>30</sup>. Drawing on these sources; ESTJ and ENTJ have been selected as personality-type preferences to be looked in candidates. Table 2 presents the descriptions of these two MBTI personality types.

**Table 2:** Brief description of ESTJ and ENTJ personality types<sup>31</sup>

	ESTJ	ENTJ
<b>Definition</b>	Practical, realistic, matter-of-fact. Decisive, quickly move to implement decisions. Organize projects and people to get things done, focus on getting results in the most efficient way possible. Take care of routine details. Have a clear set of logical standards, systematically follow them and want others to do so. Forceful in implementing their plans.	Frank, decisive, assume <i>leadership</i> readily. Quickly see illogical and inefficient procedures and policies, develop and implement comprehensive systems to solve organizational problems. Enjoy long-term planning and goal setting. Usually well-informed, well-read, enjoy expanding their knowledge and passing it onto others. Forceful in presenting their ideas.
<b>Workplace Contribution</b>	Drives to take charge, to see the practical facilitation of a task, and to complete it with dispatch and skill.	Through, hard-charging arguments and action, intellectually inspires and challenges everyone to experience a vision and to move toward its fulfillment and dispatch.
<b>Leadership Qualities</b>	Takes charge, demands loyalty, pushes hard to accomplish a task and tells it like	Is task-driven and demanding, with a motivational spin for everyone to get on

	it is.	board and move toward challenging the goal.
<b>Suggested Project Management Jobs</b>	Practical team manager, quick answer problem-solving, role management, execution manager.	Intuitive team leader, intellectual leader, task driven manager

In this study Spanish version of MBTI (Form G) is used<sup>40</sup>. MBTI is a forced-choice, self-report questionnaire.

### 3.3.2 Belbin's Team Role Inventory

Belbin in 1981 introduced the concept of "team role" and since its introduction the theory has been used for counseling, development, team performance<sup>32-37</sup>. Belbin's team role was based on 9 years observations with teams of middle managers taking part in General Management Course at Henley Management College. Participants of the study were assessed by using a multi-method technique (combining personality tests, critical thinking inventories, and observational methods) and following these efforts different clusters of behaviors were identified; "team roles". Team role has been defined as "a tendency to behave, contribute and interrelate with others at work in certain distinctive ways"<sup>38</sup>.

Belbin maintained that not only do team roles exist as behaviors and thinking styles but individuals will tend to have distinctive preferences or "natural" roles which will be assumed in most occasions. Accordingly, Belbin defined eight roles and coined them as; Chairman, Shaper, Plant, Monitor-Evaluator, Resource Investigator, Team Worker, Company Worker, Completer-Finisher<sup>38</sup>.

Among these eight team roles Coordinator and Shaper appear as the two distinctive leader types. Coordinator is the mature and confident guiding and controlling leader who organizes and controls the activities of the team, clarifies goals, promotes decision making. Coordinator takes the maximal advantage of team's human resources. On the other side of the spectrum, Shaper is the challenging, dynamic confrontational leader who pushes the members to excel obstacles. Shaper questions opinions and decisions and makes members take extra effort in their work. Therefore, Shaper and Coordinator roles have been inferred as the preferential team roles for a fourth-year team leader.

Students' team roles were determined using the printed version of Self-Perception Inventory<sup>38</sup>. The test consists of seven sections; for each section the individual distributes 10 points among 8 statements, based on how strongly they feel about each statement.

### 3.3.3 Leadership-Style Inventory:

Consulting firm Hay/McBer's research, drawn on 3,781 executives, identified six different types of leadership styles (Table 3).

**Table 3:** Descriptions of the six leadership styles<sup>39</sup>

	<b>Coercive</b>	<b>Authoritative</b>	<b>Affiliative</b>	<b>Democratic</b>	<b>Pacesetter</b>	<b>Coaching</b>
When appropriate	In crisis or to start a turnaround	When change requires new vision or to provide clear direction	To motivate people in stress or to heal team conflicts	To build consensus or get employee input	To get quick results from a motivated and competent team	To help improve performance or develop strengths in employees
Objective	Demand immediate compliance	Mobilizes people toward a vision	Creates harmony	Forges consensus through participation	Sets high standards for performance	Develops people for the future
Impact on climate	Strongly negative	Most strongly positive	Highly positive	Highly positive	Highly positive	Highly positive

Admittedly, each of the six leadership styles is necessary for a skilled leader and should be applied interchangeably depending on the requirements of the situation. Considering the responsibilities of a fourth-year leader and the requirements of the position, *Authoritative* and *Coaching* styles have been selected as the most preferable leadership styles for fourth-year student leaders.

As mentioned before, one important responsibility awaiting the leader of a first-year project team is to create a vision for the future (Table 1). Authoritative (sometimes called the “visionary”) leader provides a clear vision that motivates the followers to be creative in the pursuit of goals and objectives. This type of leaders often acts as agents of change and generates the most positive climate (Table 3).

An equally important responsibility for a fourth-year team leader is to develop first-year students in terms of improving their capacities and abilities. Coaching leader is skilled at identifying and building on the potential of followers. Focusing on the personal development this style enables followers to cope with challenges, experiment with new ideas, and accept responsibility for failure.

The Hay Group Inventory of Managerial Style<sup>41</sup> (Spanish version) was utilized for the determination of students’ leadership styles

Based on the inferences from these psychometric tests, it has been decided that a potential candidate need to possess at least one the leader-linked personality preferences identified as by the tests as;

- ESTJ or ENTJ (MBTI)
- Shaper and/or Coordinator (Belbin’s Team Role)
- Authoritative and/or Coach (Leadership Style)

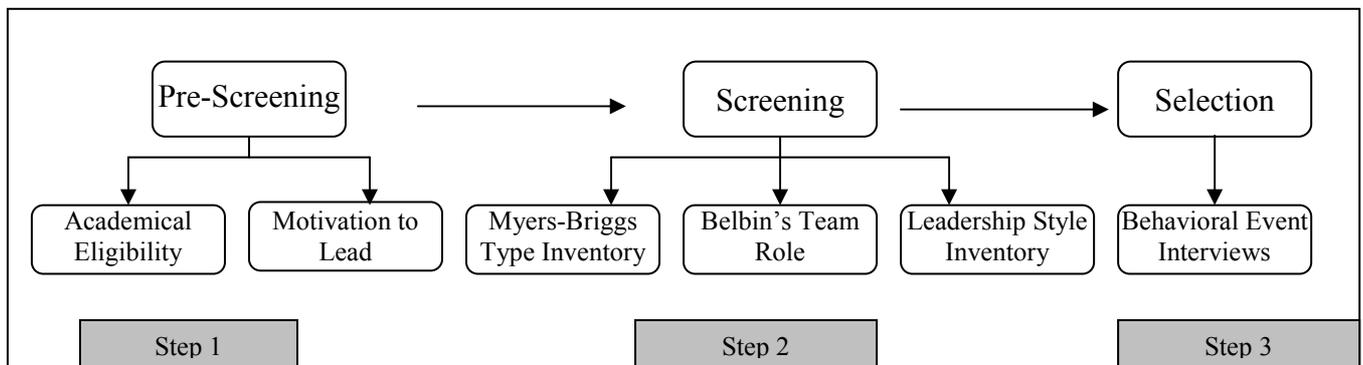
Combining a leader’s suggested personality preference with the other determinants of leader potential (academical eligibility, motivation to lead, and leadership competence) a profile for a potential and ideal team leader is created (Table 4).

**Table 4:** The profile for a potential leader candidate for the first-year project teams

Academical Eligibility	Motivation to Lead	Personality			Leadership Competence
		MBTI	Belbin's Team Role	Leadership Style	
√	√	ESTJ or ENTJ	Shaper and/or Coordinator	Authoritative and/or Coaching	√

#### 4. Leader Selection Process

The leader selection is based on the theoretical frame given above and is a three-step process (Figure 1) and this section provides information about how the *leader selection process* is implemented in PMP course in 2007-2008 academic year.



**Figure 1:** Schematic diagram of the steps in leader selection

A total of 33 students were enrolled to PMP course. First day of the course was dedicated to informing the students about PMP course dynamics with more emphasis given to the theme of participation in project teams. Students were acknowledged that in the continuum of the course they would be participating either as leaders in 1<sup>st</sup>-4<sup>th</sup> year integrated projects or as team members in 4<sup>th</sup> year project teams. The descriptions and responsibilities of both roles (team leader and team member) were explained to the students. Students were acknowledged they may become a leader of first-year teams with the understanding that they have to undergo a selection process. Depending on the number of the students who were enrolled to first year courses (n=59) the number of available places for leadership position for first year project teams has been announced as 11 (one third of the students in PMP course).

The selection process took place in the beginning of the academic year. The first step, distribution and collection of the short form, was carried out in the first week of the academic year. The second step involves the application of psychometric testing. In this step, students were instructed about the nature and underlying theory of each one of three psychometric tests. The students were acknowledged that there were no right or wrong personality preferences and that these personality preferences would be helpful in positioning them to roles that they would be feeling most comfortable with. It was also emphasized that results from these tests would enable them to become aware of their individual differences and preferences which would help them to recognize and comprehend each others roles and contribution to the team. During a two-week-period (after the first step) three psychometric tests have been administered to all of the

students in the PMP course. The results from step 1 and step 2 yielded a list of candidates. These candidates were invited to the final step in the selection process; behavioral event interviews (BEI). BEI's were conducted by the PMP tutors. Each candidate was interviewed for 15-20 minutes to verify leadership competence.

First Step: Selection

The first step in the selection process identifies the students with the adequate academical eligibility and motivation to become a leader of first-year project teams. The results from the initial survey demonstrated that more than half of the PMP course students (N=18) met the academical requirement to become one of the team leaders. However, contrary to our expectations not all students with academical eligibility were willing to take on the leader role (Table 5). Half of the students with academical eligibility (N=9) did not want to be a leader of the first-year project teams.

**Table 5:** The relationship between students' academical eligibility and motivation to lead

		Motivation		Total
		Yes	No	
Academic Requirement	Yes	9	9	18
	No	2	13	15
Total		11	22	33

Generally those students stated their concern with the time requirement for the project. They were not sure if they could manage to find sufficient time to dedicate on the project. Not to deny, being a team leader involves some certain responsibilities and costs. It may be possible that no-desire-to lead students were *calculative*<sup>11</sup> about the costs and responsibilities of leading a first-year team relative to its benefits. Consequently those students might have shirked leadership role to avoid the costs and responsibilities linked to it. This is one assumption and of course there could be many other factors affecting students' motivation to become a leader (i.e. past leadership experience, values and personality). However, it is not the intent of this paper to discuss in detail the reasons why the students did (not) want to lead first-year project teams. Key to our approach was the identification of students' with the motivation to lead a first-year project team. As noted earlier, without motivation a student would not be successful in leading a team. Therefore, the students who did not wish to lead the teams (N=22) were not considered as candidates for the leadership position and were placed in one of the 4<sup>th</sup> year project teams depending on their preferences.

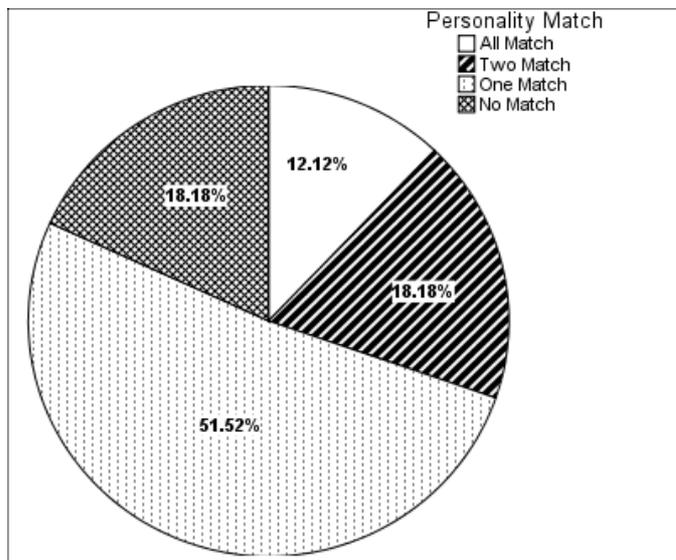
At the end of first step, a total of eleven students have been identified as having the motivation to participate in leadership role with two of them not meeting the academic requirements. At this point we were confronted with the problem of not having enough number of students with both academical requirements and motivation. As mentioned before, the required number of students for the leader position was eleven and we had nine after the first step of the selection process. It was the decision if to include the other two students; the ones who wish to become leaders but do not meet the academic requirements. It was agreed upon to involve these students in the second step on condition that students don't have more than one course pending from first-year. The two students have claimed that they have only one first-year course to approve.

Therefore, first step yielded eleven students as potential candidates. Following this step was the analysis of personality profiles.

Second Step: Psychometric Testing

The second step intends to identify if the candidates possess adequate personality preferences salient to leadership. For this reason, students’ preferences, derived from previously mentioned three psychometric tests, are compared with the ones of a leader (see Table 4).

Personality profile analysis of PMP class revealed that 81.82% of the PMP students display personality preferences in relation to leadership with 51.2% of the students demonstrating at least one personality type preference related to leadership (Figure 2).



**Figure 2:** The distribution of PMP students’ number of personality preference matches with the leader-linked preferences

Only 18.18% of the students did not demonstrate any of the three personality preferences. It was interesting to find out that, students who do not possess leader-type preferences did not want to become leaders either (Table 6). Yet there were some students who demonstrate adequate preferences to be a leader but not willing to become one.

**Table 6:** The relationship between students’ personality match with leadership and motivation to lead

		Personality Match			
		No Match	One Match	Two Match	All Match
Motivation to Lead	No	6	10	3	3
	Yes	0	7	3	1

The profiles of potential candidates from Step 1 (N=11) is presented in Table 7. This table demonstrates the match between students’ preferences with the ones of a leader. As clearly can be seen from the table, each student has a profile which exhibits at least

one personality preference match. In this respect, these eleven students fulfilled the necessary conditions to be announced as candidates for leader position hence to proceed to the third and final step of leader selection process; behavioral event interviewing.

**Table 7:** The personality profiles of potential candidates

Leader Coding	Belbin's Role		Leadership Style		MBTI
	Primary	Secondary	Primary	Secondary	
L1	Shaper	Coordinator	-	-	ESTJ
L2	Shaper	Coordinator	-	-	-
L3	Shaper	-	Authorative	-	ESTJ
L4	Shaper	-	Authorative	-	-
L5	Shaper	-	-	Authorative/ Coercive	-
L6	Shaper	-	-	-	-
L7	-	Coordinator	-	-	ESTJ
L8	-	Coordinator	-	Authoritative	-
L9	-	-	-	Authorative	-
L10	-	-	-	Coach	-
L11	-	Shaper/ Resource Investigator	-	-	-

### Step 3: Behavioral Event Interviews

Behavioral event interviews were conducted by PMP tutors. Each candidate was interviewed for about twenty minutes to assess their level of leadership competence. Prior to the interviewing candidates' personality profiles were checked once more to look over the potential weaknesses and strengths of the students. The interviewing questions were mostly related to the demonstration of competences with regard to teamwork, initiative, responsiveness to change, and interpersonal communication. In addition to these questions there were ones related to candidates' areas of improvement. For example a candidate with introverted attitude was questioned more about interpersonal understanding and communication. During the interviews, students' skills in presenting themselves and conveying their thoughts in a comprehensible manner and their self-confidence were also observed. In this final step all candidates (N=11) found to have adequate leadership competence to take on the leader role of first-year integrated design project teams.

These eleven students were selected to become the team leaders of first-year teams for two consecutive fifteen-week periods. Beyond any doubt the effectiveness of selected team leaders has to be measured. This measurement will be carried out by both assessing;

- (a) Students' leadership competence and
- (b) Their teams' effectiveness

Leadership competence will be measured through application of several instruments and techniques; 360 degree feedback process, analyses of personal diaries, the evaluation of two oral presentations delivered to the coach (one presentation per period), and the carrying out of behavioral event interviews.

Assessing the team effectiveness is also crucial for measuring leadership effectiveness. It has been argued that in order to know how a person is doing as a leader one needs to find out how the people under his/her leadership are doing<sup>42</sup>. Therefore, a leader's ability to *build an effective team* has been argued to be the key to his/her leadership effectiveness<sup>43</sup>.

Five factors have been identified to be essential for team effectiveness<sup>5</sup>;

- Team Health (i.e. trust, satisfaction, respect for each other)
- Effectiveness of Implementation (i.e. client satisfaction)
- Meeting Effectiveness (i.e. time management, clarity of agenda, listening)
- Effective Decision Making (i.e. participation of members in the decision making)
- Effectiveness of Team Objectives (i.e. objectives are specific, measurable, challenging and scheduled)

The effectiveness of first-year project teams will be measured by assessing the above-mentioned five factors. Table 8 presents the measurement methods used for evaluating each one of the five team effectiveness dimensions. The following section presents the preliminary results of Team Climate Survey.

**Table 8:** Measurement methods used for evaluating each team effectiveness dimensions

<b>Criteria for Evaluating Team Effectiveness</b>	<b>Measurement Methods</b>
1. Team Health	Team Climate Survey
2. Effectiveness of Implementation	<ul style="list-style-type: none"> <li>○ Satisfaction of project's stakeholders, namely first-year students and first-year professors.</li> <li>○ Evaluation of the final products of the project (a design report and a poster or an oral presentation).</li> <li>○ The management reports (team charter and close-out reports).</li> </ul>
3. Meeting Effectiveness	Observation of formal meetings
4. Effective Decision Making	Observation of formal meetings
5. Effectiveness of Team Objectives	<ul style="list-style-type: none"> <li>○ Evaluation of the final products of the project (a design report and a poster or an oral presentation).</li> <li>○ The management reports (team charter and close-out reports).</li> </ul>

## 5. Team Climate Survey Results

### 5.1. Team Climate Survey

Researches have argued that *if the climate of a team is unsatisfactory, the team will not be able to produce a quality decision or effectively accomplish its objectives*<sup>5</sup>. The indicators of a healthy team climate are mainly<sup>5</sup>; confidence, trust, respect for each other, high level of communication, conflict resolution, satisfaction. In order to measure the climate in first-year project teams a survey, *Team Climate Survey*, has been designed.

This survey consists of 22 items which addresses the indicators of a healthy team climate (i.e. “*I trust in all team members*”). The survey has been pilot-tested in 2006-2007 academic year. The reliability analysis yielded a high alpha coefficient (0.91), indicating high internal consistency among its 22 items. A copy of the questionnaire is available from the author upon request.

The survey employs a six-point Likert-type rating scale with all scale points labeled by verbal descriptors without the provision of a mid-point. The scale goes from 1 (“highly disagree”) to 6 (“highly agree”). Team members were asked to use this rating scale to assess their level of agreement or disagreement with the survey items. The survey has been administered before the end of first academic semester (2007-2008).

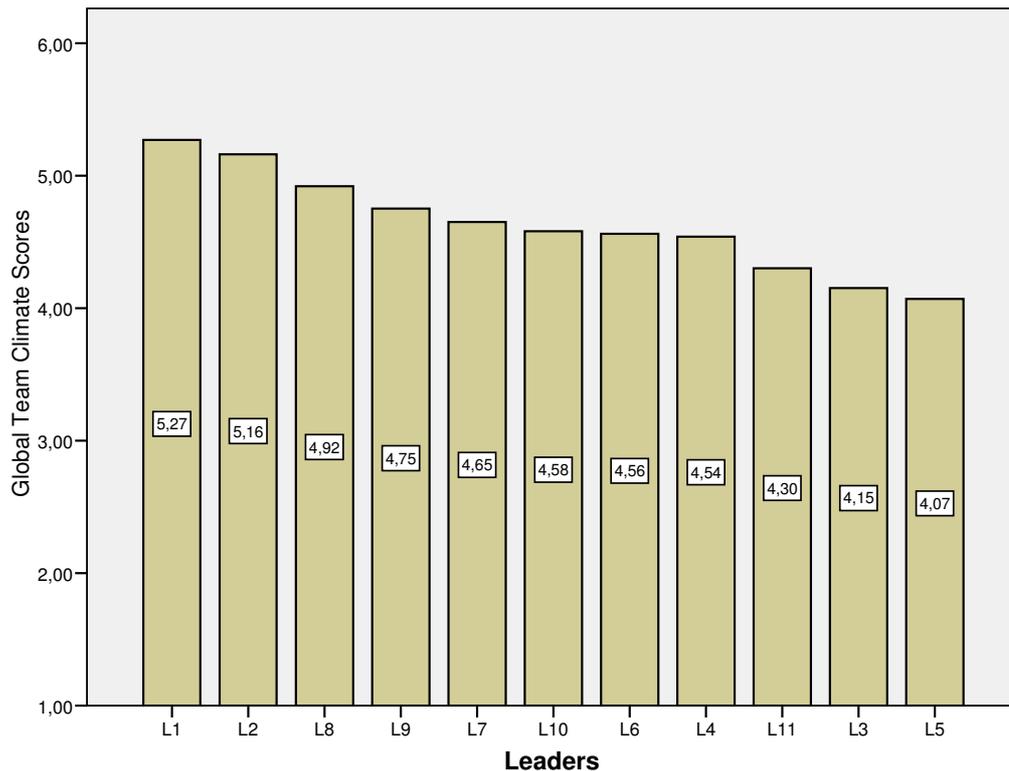
## 5.2. Preliminary Results

A total of number of 49 first year students has completed the team climate survey. The number of members and the number of respondent students in each first-year project teams are presented in Table 9.

**Table 9:** Number of members and number of respondent students in first-year project teams

<b>Leader Coding</b>	<b>Number of Members</b>	<b>Number of Respondents</b>
L1	4	4
L2	5	5
L3	6	5
L4	6	6
L5	5	4
L6	3	3
L7	5	5
L8	6	3
L9	5	5
L10	6	6
L11	3	3
Total	54	49

Global team climate scores (for each leader’s team) were obtained by averaging first-year students’ ratings across the twenty-two items (Figure 3). In fact for all the team leaders, team climate scores were found to be equal or higher than Four (Agree). Of the eleven leaders, L1 and L2 have received higher global team climate scores. On the basis of previous research this result was expected. Both leaders have the two distinct leader types as their top two team role pairings; a combination of *shaper-coordinator* (Table 7). Belbin nicknamed this shaper-coordinator combination as *boss* to give the picture of the behaviour to be expected from those people with this type of combination. Therefore, it is understandable that leaders “L1” and “L2” have created and developed a more positive and healthy team climate which in turn shows that a leader’s personality might have an impact on the team and its effectiveness.



**Figure 3:** Global team climate scores

A curious incident took place just after the beginning of the second academic semester. The team under the leadership of “L11” broke up. This incident was interesting as this leader was the weakest fit to the leader selection criteria presented in this paper. However, to conclude that the personality of the leader was the main reason for the failure of the team, further analysis is required. Results from the focus group with the members of this team, which will be carried out in the end of the second academic semester, may provide an in-depth understanding of the possible reasons for this incident.

### Conclusions

In this paper, a methodical leader selection process is presented for the identification of students with the highest potential to lead a project team. This powerful selection process provides a clear, objective, and research based method for the evaluation of leadership potential. The power of the process stems from integrating the variables that are most relevant to the making of a leader. This ensures that the very important responsibility of leadership is given to those students who are most capable of fulfilling.

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## References

1. Giralt, F., Herrero, J., Grau, F.X., Alabart, J.R., Medir, M. (2000), "Two Way Integration of Engineering Education through a Design Project", *Journal of Engineering Education*, Vol.89, No.2, 219-229.
2. Zaccaro, S.J., Rittman, A.L., Marks, M.A. (2001), "Team Leadership", *The Leadership Quarterly*, Vol.12, 451-483.
3. Weinkauff, K., and Hoegl, M. (2002), "Team Leadership Activities in Different Project Phases", *Team Performance Management*, Vol.8, No.7/8, 171-182.
4. Morris J., and Mountfort P. (1997), "The Leader and the Team", *Managing Service Quality*, Vol.7, No.6, 314-317.
5. Singh, A.K., and Muncherji, N. (2007), "Team Effectiveness and Its Measurement: A Framework", *Global Business Review*, Vol.8, No.1, 119-133.
6. Bradley, J.H, and Hebert, F.J. (1997), "The Effect of Personality Type on Team Performance", *Journal of Management and Development*, Vol.16, No.5, 337-353.
7. Steckler, N.A., and Fondas, N. (1995), "Building Team Leader Effectiveness: A Diagnostic Tool", *Organizational Dynamics*, Vol.23, 20-35.
8. Parker, G.M. 1990. *Team Players and Teamwork: The New Competitive Business Strategy*. San Francisco: Jossey-Bass.
9. Atwater, L.E., and Brett, J.F. (2006), "360-Degree Feedback to Leaders: Does It Relate to Changes in Employee Attitudes?", *Group and Organization Management*, Vol.31, No.5, 578-600.
10. Popper, M. (2005), "Main principles and Practices in Leader Development", *Leadership and Organization Development Journal*, Vol.26, No.1, 62-75.
11. Chan, K.Y., and Drasgow, F. (2001), "Toward a Theory of Individual Differences and Leadership: Understanding the Motivation to Lead", *Journal of Applied Psychology*, Vol.86, No.3, 481-498.
12. Popper, M., and Mayseless, O. (2007), "The Building Blocks of Leader Development: A Psychological Conceptual Framework", *Leadership and Organization Development Journal*, Vol.28, No.7, 664-684.
13. Judge, T.A., Bono, J.E., Ilies, R., Gerhardt, M.W. (2002), "Personality and Leadership: A Qualitative and Quantitative Review", *Journal of Applied Psychology*, Vol. 87, 765-80.
14. Atwater, L.E., Dionne, S.H., Avolio, B., Camobreco, J.F., Lau, A.W. (1999), "A Longitudinal Study of the Leadership Development Process: Individual Differences Predicting Leader Effectiveness", *Human Relations*, Vol. 52 No.12, 1543-62.
15. Church, A.H., Waclawski, J. (1998), "The Relationship between Individual Personality Orientation and Executive Leadership Behaviour", *Journal of Occupational & Organizational Psychology*, Vol. 71, 99-125.
16. Hautala, T.M. (2006), "The Relationship between Personality and Transformational Leadership", *Journal of Management Development*, Vol.25, No.8, 777-794.
17. House R.J., and Howell, J.M. (1992), "Personality and Charismatic Leadership", *Leadership Quarterly*, Vol.3, No.2, 81-108.
18. Najar, M. J., Holland, B. D., & Van Landuyt, C. R. (2004, April). *Individual Differences in Leadership Derailment*. Paper presented at the 19th annual conference of the Society for Industrial and Organizational Psychology, Chicago, Illinois.
19. Myers, I.B., McCaulley, M.H., Quenk, N.L., Hammer, A-L. *A Guide to the Development and Use of the Myers-Briggs Type Indicator*. Consulting Psychologists Press, Palo Alto, CA (1998).
20. The EFQM Excellence Model. European Foundation for Quality Management, Brussels (2003).
21. McClelland, D. C. (1998), "Identifying Competencies with Behavioral-Event Interviews", *American Psychological Society*, Vol. 9, No. 5, 331-339.
22. Spencer, L.M., Spencer, S.M (1993), *Competence at Work: Models for Superior Performance*, Wiley, New York, NY.
23. Hoever, V.A. (2006). *High-Impact Interview Questions, 701 Behavior Based Questions to Find the Right Person for Every Job*. American Management Association: New York.
24. Schmidt, F.L. and Hunter, J.E. (1998), "The Validity and Utility of Selection Methods in Personnel Psychology: Practical and Theoretical Implications of 85 years of Research Findings" *Psychological Bulletin*, Vol.124, 262-274.
25. Amato, C.H., and Amato, L.H. (2005), "Enhancing Student Team Effectiveness: Application of Myers-Briggs Personality Assessment in Business Courses", *Journal of Marketing Education*, Vol.27, 41-51.
26. Coe, C. (1992), "The MBTI: Potential Uses and Misuses in Personnel Administration", *Public Personnel Management*, Vol.21, No.4, 511-522.

27. Summers, S. R. (1995), "Team Building Using the Myers-Briggs Type Indicator: Appreciating the Talents within Your Team", *The Catalyst*, Vol. 25, No. 1, 10-13.
28. Kerr, P.L. "Two Flavors of T: Fundamentally Different", *Type Works*, Vol.44, 7-8.
29. Kroeger, O., and Thuesen, J.M., *Type Talk at Work*, Delacorte Press, New York, NY, 1992.
30. Milroy, C. (2000, July), "Making Training Work: The Role of the Manager as a Team leader and Coach in the Retail Nursery Industry", *Australian Psychological Type Review*, Vol.2, No.2, 9-16.
31. Vargas, R. V. (2005). Avoiding Mistakes during the Team Acquisition: Find the Right People to the Right Function Using MBTI. Proceedings of PMI Global Congress 2005-EMEA (PWP03.PDF, CID 6953). Newtown Square, PA: Project Management Institute.
32. Aritzeta, A., Senior, B., Swiles, S. (2005), "Team Role Preference and Cognitive Styles", *Small Group Research*, Vol.3, No.4, 404-436.
33. Senior, B. (1997) "Team Roles and Team Performance: Is there "Really" a Link?", *Journal of Occupational and Organizational Psychology*, No. 70, 241-258.
34. Prichard, J.S. and Stanton, N.A. (1999) "Testing Belbin's Team Role Theory of Effective Groups", *Journal of Management Development*, Vol. 18, No. 8, 652-665.
35. Partington, D. and Harris, H. (1997), "Team Role Balance and Team Performance: An Empirical Study", *The Journal of Management Development*, Vol.18, No. 8, 694-705.
36. Henry, S.M. and Stevens, K.T. (1999), "Using Belbin's Leadership Role to Improve Team Effectiveness: An Empirical Investigation", *The Journal of Systems and Software*, Vol. 44, No.1, 241-250.
37. Park, W. and Bang, H. (2002, March 26-27) "Team Role Balance and Team Performance", Belbin Biennial Conference, "Changing Role of Management in the 21st Century," Clare College, Cambridge.
38. Belbin, M. (1981). *Management Teams, Why They Succeed or Fail*. London: Heinemann.
39. Goleman D. (2000), "Leadership That Gets Results", *Harvard Business Review*; March-April, 78-90.
40. Briggs Myers I. *MBTI: Inventario Tipológico Forma G*. Manual. Madrid: TEA Ediciones. 1991.
41. *Managerial Style Questionnaire - Trainer's Guide*. Hay Resources Direct, Boston (1994).
42. Cohen, E. and Tichy, N. (1997-May), "How Leaders Develop Leaders", *Training & Development*, 58-73.
43. Hogan, R., Curphy, G., and Hogan, J. (1994), "What We Know About Leadership: Effectiveness and Personality", *American Psychologist*, Vol. 49, 493-504.