

# Using Myers-Briggs Type Indicator (MBTI) as a Tool for Setting up Student Teams for Information Technology Projects

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**Abstract**-IT projects follow established management methodologies governing the life cycle of the project. It is commonly accepted that the development of information systems is a complex task involving technical, human, and organizational issues. In order to instruct students, one of the most used methodologies is organizing them into small groups and provides them with a project. The groups act as project teams performing a project close to their field of professional interest. This methodology is usually named Project Based Learning (PBL). As is the case with actual projects, there are other issues in addition to the technical skills influencing the group outcomes: human aspects and personality. The Myers-Briggs Type Indicator (MBTI) has become one of the most widely-used psychometric instruments for assessing personality characteristics regarding work environment. Learning more about team member personalities and how different personalities compliment or conflict with each other can be useful information in building and leading a project team. The purpose of this paper is to discuss the most relevant features that help create successful student project teams within Information Technology (IT) field, in relation to the MBTI personality characteristics. Three most usual profiles within the IT projects are considered: system analyst, designers, and programmers. The results of this study have the implications for setting up student groups in collaborative projects under the IT studies.

**Keywords**-Information Technology Projects, Project-based Learning; Setting Up Groups; Learning Through Projects; MBTI

## I. INTRODUCTION

IT projects follow established management methodologies governing a project's life cycle. It is commonly accepted that the development of information systems is a complex task, involving technical, human, and organizational issues. The purpose of this paper is to explore the most relevant personality features when building a successful team within the Information Technology (IT) field, and how this situation could be translated to academic environment through Project Based Learning methodology (PBL).

IT projects are notorious for their failure rate. The Chaos Report, a study periodically published by the Standish Group [<http://www.standishgroup.com>], has consistently shown that there is a large number of problematic and unsuccessful projects in this sector. Other surveys found 24% of success rate in enterprise management solutions [1]. Several authors try to explain the low success rate for this field. For example, Klein and Jiang [2] state that much failure is due to a difference in expectations prior to the start of a new system development. Much of the difference in expectations may be in the use of metrics not fully understood by every stakeholder

in a new system. Current theory and management practice suggest a better focus on building an understanding of the critical evaluators to develop a common understanding of expectations, which will improve success rates. Such activity requires broader viewpoints of success and the input of more stakeholders well before any project tasks are conducted. The difficulty in delivering IT projects successfully comes from the challenge in specifying the system requirements in a way that will create business benefit and lead the intangible nature of the product being produced. Reel [3] defines ten signs that indicate that an IT project is in jeopardy:

1. Software people don't understand their customer's needs.
2. The product scope is poorly defined.
3. Changes are managed poorly.
4. The chosen technology changes.
5. Business needs change.
6. Deadlines are unrealistic.
7. Users are resistant.
8. Sponsorship is lost
9. The project team lacks people with appropriate skills.
10. Managers avoid best practices and lessons learned

Most of the ten factors are strongly related with teamwork and personality aspects, especially communication and coordination aspects. The Chaos report results also seem to confirm that. The scale of many development efforts is large, leading to complexity, confusion, and significant difficulties in coordinating team members. Uncertainty is common, resulting in a continuing stream of changes that slow down the project team. Interoperability has become a key characteristic of many systems. New software must communicate with existing software and conform to predefined constraints imposed by the system or product.

In order to overcome these problems, a team working environment is needed. Researchers are beginning to postulate that the most effective software development teams are also the teams that contain a variety of different personality or temperament types [4] [5]. Teamwork capability of team members and working relationships among team members, which directly affect team performance, are important for a successful project team and cannot be overlooked. If team

members are not competent with effective teamwork and do not have good working relationships among them, the team will not work successfully even though each team member has strong technical skills [6]. According to Amabile [7], "Team member diversity and mutual openness to ideas may operate on creativity by exposing individuals to a greater variety of unusual ideas. Such exposure has been demonstrated to positively impact creative thinking." As summarized by Allen [8], many studies have shown a positive relationship between project performance and communication within each project team. In particular, Smart and Barnum [9] stated that many teams fail often due to poor or inadequate communication. It is also one of the most recognized key success factors for IT projects. The important role of communication between IT personnel and users during system development has been demonstrated in several studies [2].

The IT curricula studies should consider those problems in order to prepare the students for facing these situations as future professionals. One way for getting that is by means of project-based learning methodology (PBL) to imitate the actual environment that they could find in an actual project. The previous related conditions should be reproduced during the PBL and the suitable atmosphere should be created.

Group work on a project is a very interesting teaching instrument, since students groups act as project teams doing a project close to their field of professional interest. This paradigm is often called project-based learning (PBL), that is an instructional methodology in which students learn important skills by doing actual projects. Students apply core academic skills and creativity to solve authentic problems in real world situations. Students use a wide range of tools. The culminating projects are tangible. Observable artifacts serve as evidence of what the students have learned. This paradigm is commonly used in technological studies, mainly in higher education, and it is becoming even more important in relation to some new teaching method learning process. Researchers report that, regardless of subject matter, students working in small groups tend to learn more of what is taught and retain the knowledge acquired longer than what is presented in other instructional formats. Students working in collaborative groups also appear more satisfied with their classes. Project-based learning is based on the constructivist learning theory, which finds that learning is deeper and more meaningful when students are involved in constructing their own knowledge. Students are responsible for creating their project plan. Usually the achieved outcomes are very good, and the level of involvement of students is very high. Under this paradigm, teachers' role is that of an academic advisor, instructor, mentor, facilitator, task master and evaluator rather than a lecturer.

But, despite considerable potential, project-based learning is not without its challenges. One of the most important is that members should work in a successful collaborative way and in a suitable condition for creativity, decision-making, open communication, then cohesiveness and so on should be promoted. An absence of suitable conditions could turn a successful project into an unsuccessful one, disabling the collaborative work. Personality type indicators could play an important role in analyzing profiles involved in this kind of projects. After several years using project-based learning in IT environment, it has been observed that some groups are more successful when some combinations of personalities coexist. The Myers-Briggs Type Indicator (MBTI) could be useful in

finding this kind of combinations and forming an assessment tool for group success. In addition, several technical profiles coexist in IT projects: system analysts, designers and programmers. Personality has also an important influence on appraisal of these profiles. Some styles are preferred for each profile in accordance to their usual tasks.

## II. THE MYERS-BRIGGS TYPE INDICATOR

The Myers-Briggs Type Indicator (MBTI) has been, for more than fifty years, one of the most trusted and widely used instruments in the world for determining personality types. This tool was developed by Isabel Myers and Katherine Briggs [10], based on Carl G. Jung's work [11] of psychological types. This theory explains that differences in human behavior are simply the result of a few variations in mental functioning. These differences relate to how people prefer to use their minds, and particularly how they perceive and make judgments, which are called functions. There are four groups, each consists of two opposite preferences:

### A. Focus of Attention:

- Extrovert (E): Those who relate best to the outer world. They are comfortable in talking and sharing with others. They gain their energy from working with groups.
- Introvert (I): Those who relate best to their inner self. They are comfortable in working quietly alone. They drain their energy from interactions in a group.

### B. Seeking Information:

- Sensing (S): Those who rely on facts, reality and no nonsense. They focus on the details. When asked to review a document, they like to find typographical errors and misspellings.
- Intuitive (N): Those who use intuition, speculation, possibilities and imagination. They focus on the big picture. When asked to review a document, they like to identify problems in how the topic in the document was developed.

### C. Decision-Making:

- Thinking (T): Decisions are made by using sound principles, laws, policy and criteria. Thinkers are analytical, logical, and objective.
- Feeling (F): Decisions are made by values, devotion, sympathy, and harmony. Feelers will take the emotions and opinions of others into consideration when making a decision. They have a strong need to maintain harmony within a group.

### 4. Relationships with the World:

- Judging (J): They are outcome-oriented, regulated, and decisive. They make decisions quickly. Judging members like to get things settled or come to a closure.
- Perceiving (P): They are process-oriented, flexible, and open-minded. They make decisions slowly. Perceiving members like to get additional information or consider a new possibility.

Using the MBTI, every individual's personality type can be described through four variables of two opposite states, which makes up a total of sixteen possible personalities (Figure 1). For example, if a person takes the MBTI test and

the type reported is ISTJ, which has preferences for introversion, sensing, thinking and judging.

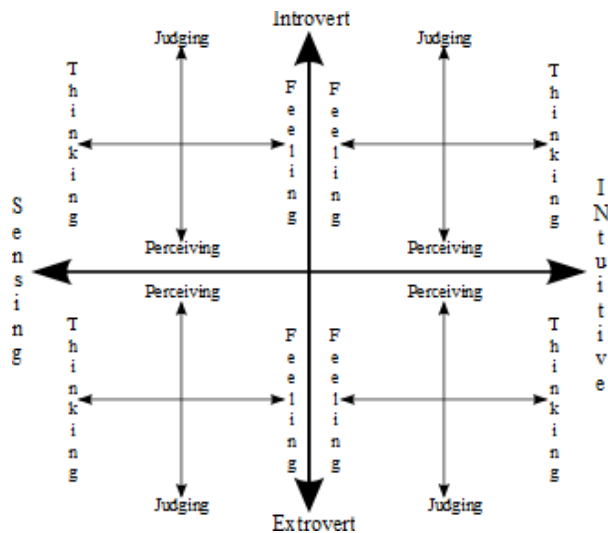


Figure 1 MBTI grid

Knowing more about the team member personalities and how different personalities compliment or conflict can be useful information in building and leading a project team. For example, MacDonald [12] highlighted the characteristics of design teams that include leadership, conflict, communication, size, team maturity, coordination, and cohesiveness. Prince [13] identified six skills of team process behaviors: leadership, assertiveness, decision-making, mission analysis, situation awareness, communication, adaptability and flexibility. Sundstrom [14] emphasized on factors such as organizational structure and culture, mature communication, group stability over time, experience, small group, and personality traits. Flexibility and involvement of teamwork also help ensure the quality of team performance [15] [16]. The Myers-Briggs Type Indicator, which has become one of the most widely-used psychometric instruments for assessing personality characteristics regarding to work environment, could be very useful in performing an assessment of those features.

Another fact that contributes to likeness and understanding is the difference in temperament [17] among individuals. Based on Keirsey theories, there are four major temperament patterns: idealist, guardian, rational and artisan. A person with an idealist temperament would tend to have an altruistic perspective and be a natural catalyst for forming a high-performing group. A person with a guardian temperament would tend to protect and preserve the order within a group. A person with a rational temperament would tend to be innovative and would excel in design and analysis. A person with an artisan temperament would tend to be spontaneous and prefer autonomy.

Keirsey and Bates [17] have identified the distribution of personality types through the sixteen cells of the four by four MBTI grid. By using this as a basis for comparison, we can gain an interesting insight into the availability of people suited to various roles in project work. The personality styles and their preferences represented by each cell in the grid reflect interaction of various combinations of temperaments, rather than the individual temperaments on their own. The descriptions provided by the MBTI give valuable insight into the differences between regular people. These differences can be the source of difficulty in understanding and

communication, the attributes that are so important in project teamwork. The most effective teams should have a good combination of personality types.

The different temperament types are four and the MBTI variables that identify them are: SJ, SP, NT and NF. Kroeger [18] describes their traits as follows.

- SJ: Administrators, precise, structure, orderly
- SP: Problem solvers, practical, resourceful, quick starters
- NT: Conceptualizers, systems planners, architects of change
- NF: People motivators, empathic, aware of others feelings, persuaders

To ensure a successful team, it is important to understand the characteristics of team members. To build a successful project team, teamwork capability of team members is needed by taking their experience, communication skills, and flexibility in job assignment into account. Personality profiling using Myers-Briggs type indicator serves as the basis of assessing each team member's abilities to work with others.

But inside the team, not all the members have the same relevance. In project teams, there is usually a student playing the role of project manager. The behavior of this student is very important because he is responsible for coordinating and leading the group. The team performance depends most of the times on the leadership style of this key role. The MBTI theory has been also applied for featuring the personality of project managers. Shenhar and Wideman [19] reported on the personality characteristics of project managers. Their analysis shows that indeed many MBTI types might be suited for project managers while others are not. However, they state that the ESTJ type is a favored type of project managers. Smith in his research [20] confirmed Shenhar and Wideman's work and found four outer quadrants of the 16 types in the MBTI table as suitable for project management. Mills [21] by using the MBTI also found that traditional managers were either ESTJ or ISTJ, the S being the dominant characteristic for project managers. Black and Slaker [22] found that NT (intuitive thinking) types had greater leadership tendencies.

Wideman and Shenhar [19] (Figure 2) also state that there is a relationship between some type of personality types and their leadership style (coordinator, administrator, explorer or driver). These styles could be translated to the well known Blake-Mouton Managerial Grid descriptions.

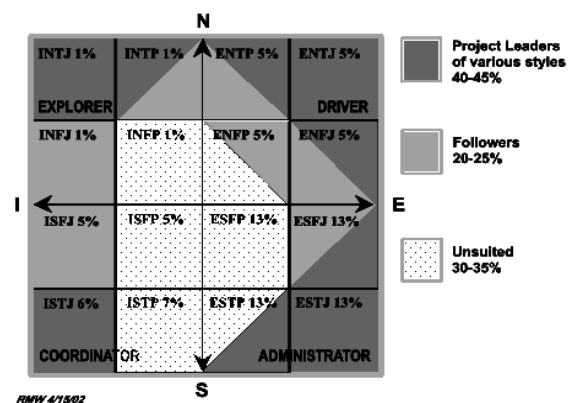


Figure 2 The MBTI grid and suitability to project management teamwork (Source: Max Wideman)

According to the classification of Figure 2, group members could be tagged as suitable project managers, followers or the unsuited.

III. IT PROFILES AND PERSONALITY TYPES

Most people agree that human factor is the key. People are the ultimate tools to develop any IT system and therefore deserve respect and study necessary to bring them up to their best performance. Focusing on people, everybody agrees that any individual is unique, and has certain personality attributes that make him work and feel good on certain tasks and with certain people. Type characteristics and affinity are essential to handle teambuilding with success.

Most studies regarding personality types of IT professionals, including the major one developed by Lyons [23], conclude that IT people have very different MBTI combinations from general population, but those combinations are remarkable similar among them [24], as shown in Table I. Although this fact might be affected by external influences, as prejudices of certain personalities to enrol computer science University courses and thereafter careers, the truth is that ISTJ and INTJ types are the two most common types found in this industry sector, as shown in Table II.

TABLE I MBTI PERSONALITY TYPES OF GENERAL POPULATION AND IT PERSONNEL

Study	I	E	N	S	F	T	P	J
General Population (%)	25	75	25	75	50	50	50	50
IT Personnel (%)	67	33	54	46	19	81	34	66

TABLE II THE TWO MOST COMMON MBTI PERSONALITY TYPES IN COMPUTING PERSONNEL

Study	ISTJ	INTJ
General Population (%)	6	1
Computing Personnel (%)	22.6	15.5

Table III shows the usual Myers-Briggs personality matrix [10] to describe the top five MBTI personality types taken from different studies, using stronger shading to mean a higher percentage of representation. The underscore character in each of the sixteen personality combinations indicates the dominant process (namely, perception or judgment) for that type.

TABLE III FIVE MOST COMMON MBTI PERSONALITY TYPES IN COMPUTING PERSONNEL

<b>ISTJ</b>	ISFJ	INFJ	<b>INTJ</b>
ISTP	ISFP	INFP	INTP
ESTP	ESFP	ENFP	ENTP
ESTJ	ESEJ	ENEJ	ENTJ

The relation between technical functions and personality types should also be discussed. Development is considered to be comprised of three main elements or subtasks, namely analysis, design and programming. Considering the types of tasks required by systems developers, it is possible to suggest personality characteristics which would facilitate proficiency in completion of those tasks. Teague [24] has proposed preferred types derived by considering which attribute of each MBTI pair would be best suited to the current and future tasks of systems analysts, systems designers and programmers as listed in Education and Training Needs of Computing Professionals and Para-professionals in Australia [25].

According to this study, analysts are required to do the following:

- determine users/clients' needs;
- identify problems in systems;
- document existing systems;
- read periodicals to keep up to date;
- identify problems in working environments;
- provide advice to management.

For analysts, the following skills suggest themselves the ability to see the 'big picture', the ability to single out the items that are relevant from large quantities of data, and the ability to interact with users and management to get their support and obtain from them the maximum amount of relevant information. The first two of these require intuition. For interactions with users and management, extraverts are better at talking (and getting responses), and presenting ideas than Introverts, Feelers excel at making people feel comfortable. Intuitive thinkers (NTs), while not as attuned to clients' feelings, as intuitive feelers (NFs), would seem to be best suited to analysis work in general. Perceivers like to explore every possibility, and consequently have difficulty making decisions, whereas judgers seek closure. Once they have found a good solution they accept it and go on to something else. A combination of judgers and perceivers in a team will help ensure that, the best rather than the first solution is found at reasonable time. Therefore, when appointing systems analysts, Teague states that we might look for NFs, NTs, extraverts, judgers, and perceivers. These will be referred to as 'preferred' characteristics for systems analysts.

In the following table, Teague [24] shows the preferred MBTI personality types for analysts (stronger shading means more preferred).

TABLE IV ADEQUATE MBTI PERSONALITY TYPES FOR ANALYSTS

ISTJ	ISFJ	INFJ	INTJ
ISTP	ISFP	INFP	INTP
ESTP	ESFP	ENFP	ENTP
ESTJ	ESEJ	ENEJ	ENTJ

TABLE V ADEQUATE MBTI PERSONALITY TYPES FOR DESIGNERS

ISTJ	ISFJ	INFJ	INTJ
ISTP	ISFP	INFP	INTP
ESTP	ESFP	ENFP	ENTP
ESTJ	ESEJ	ENEJ	ENTJ

TABLE VI ADEQUATE MBTI PERSONALITY TYPES FOR PROGRAMMERS

ISTJ	ISFJ	INFJ	INTJ
ISTP	ISFP	INFP	INTP
ESTP	ESFP	ENFP	ENTP
ESTJ	ESEJ	ENEJ	ENTJ

System designers have a wide range of tasks. These include:

- documenting information needs
- prototyping
- designing processing functions
- defining inputs and outputs

The first part of the design stage will require similar characteristics to those required for analysis, as it involves group discussion and consideration of large amounts of data. In the later stages of defining inputs and outputs, the work requires detail, often performed by individuals working alone.

The following table shows the preferred MBTI personality types for this role according to Teague. Again, stronger shading means more preferred.

The most common tasks of programmers are related to the coding from specifications, compiling and testing programs. Programmers working from the specifications of designers need to be logical (T), detailed, structured and precise (SJ), and happy when working alone (I). According to Teague, given these characteristics, it is not surprising that so many computing professionals are ISTJs. The following table shows the preferred MBTI personality types for this role according to Teague:

#### IV. METHODOLOGY

Students from Spanish University enrolled in the last course of Software Engineering Degree have been taking the MBTI personality test in order to assess their personality types for the last four years. More than 30 groups of students have been assessed, with a total of 200 students overall. It has been assessed whether there could be a relation between the combination of MBTI personality types and the quality of the appraisal works developed by the students. In order to assess the quality of the resulting works, some criteria have been considered:

1. Technical qualities.
2. Quality of documentation presented.
3. Team work aspects, like management, coordination and communication.

The technical quality shows aspects of adequacy and scope of a project, fulfillment of requirements, use of innovative techniques, adequacy to a real-life environment, realism in project estimation and detailed planning.

The quality of documentation reflects whether it is well adjusted to the demands of structural documentation with a clear and smooth writing. Detail and clarity of exposition are also considered.

Student groups work together as a project team. Groups are formed by about seven students each. Different profiles are assigned to the students: analysts, designers and programmers. In addition, one of the students takes the role of project manager, acting as coordinator of the group.

The tasks of the instructor are of a double nature: speaking both on behalf of the customer, guiding students on contents and focus on the project, and also from a pedagogical approach as their tutor, instructing and monitoring the group. Group monitoring is made through weekly sessions. The aim of this meetings is to present the work already done, discuss possible technical aspects and planning of due work. Minutes

are also a part of this monitoring process, reflecting what has been said and done in every work meeting.

Students have a website at their disposal to upload work documents, and to include discussion forums to communicate with each other and raise any doubts. These forums are also monitored as part of the group's assessment.

Next section is used to discuss about the observed results during the timeline of the study, the relation with the existing theories and the conclusions drawn from the study.

#### V. DISCUSSIONS OF RESULTS

Analyzing the projects carried out during these years, lack of internal coordination was detected as the most recurrent cause explaining failure to achieve expected results in certain groups. A relationship could be observed between the MBTI profiles of the members and some cases of poor coordination and internal conflicts. For example, two of the most conflictive groups were composed with similar types: there were a large number of members with the same profile. In both cases, almost all the members of the group were ISTJ. Also in both groups there were conflicts between group members. Most of the conflicts occurred among 'unsuited' members according to Wideman classification (Figure 2). Nevertheless, other groups reach high level result, showing more balanced mix of profiles.

The key question is how to build a team that is efficient and effective. The existing theories provide several answers. Myers [10] state that "The best co-workers probably are people who differ on perception (S/N) or judgment (T/F) (but not both) and are alike on at least one other preference. This much difference is useful, and the two or three preferences they have in common help them to understand each other and communicate". She also mentions, "Two people, alike in their kind of perception or their kind of judgement but not both, have the makings of a good working relationship. Their shared preference gives them common ground and their dissimilar preference gives them, as a team, a wider range of expertness than either has alone. When co-workers differ on both perception and judgment, they have a problem". This is especially important in teamwork in which a mixed group of SN and TF members is needed for problem solving and decision making.

Therefore, the rule of thumb is that, diversity in personality, as it always happens in nature, is positive for a team to accomplish goals efficiently, but it implies the necessity to balance properly the perception and judgement functions to avoid future problems.

As we introduced previously, communication is a key success factor for IT projects. According to Myers theory [10], thinkers are by nature impersonal and critical of anything they consider wrong. When they disagree with feeling types, thinkers may state their disagreement so forcefully and bluntly that the feeling types feel being attacked. Communication with feeling types should make use of their feeling. Communication with a thinker should be as logical and orderly as the feeling type can make it. Communication between sensing and intuitive types presents also several problems due to personality differences. Sensing types want the solution to be workable, thinkers want it systematic, feeling types want it humanly agreeable, and intuitive want a door left open for

growth and improvement. Given understanding and good will, they should be achievable.

In the study we also have considered personality types in relation to three profiles: analyst, designers and programmers. In the next sections we will show the most recommended MBTI type combinations for specific IT roles given a standard software engineering method, as well as possible personality type combinations to improve team performance, as well as discussion about the Teague suggestions and those drawn from our experience.

#### A. Analyst Role:

The analysts should have an analytical mind, the ability to single out items that are relevant from large quantities of data, and the ability to interact with users and management to get their support. When building a team of analysts, the most preferred personalities should include NT and/or NF pairs. Although Teague says that extroversion is best suited for this role, the variable Extroversion/Introversion is measured as a percentage, which means that a moderate introverted individual (i.e., E 40% / I 60%) could do this function as well as an extroverted and actually are more common in these careers [Table II and III]. Also when teaming up with people we must look for individuals that match with perception and/or judgment MBTI values, and to obtain a final group with similar number of people who prefer perception and who prefer judgment as their "dominant" process, to ensure enough time to collect information and to make a decision.

#### B. Designer Role:

When building a team of designers, we should include a diverse combination, if available, of the most shaded MBTI types shown above in Table V. If we take a close look at these personalities, we find that represent the four temperaments described earlier, which means that we must take special care when mixing them because conflict and poor performance is likely to arise. Thus we must look for individuals that match perception and/or judgment MBTI values as much as possible, and to obtain a final team with similar number of people who prefer perception and who prefer judgment as their dominant process, to ensure enough time to collect information and to make a right decision. Common personalities as INTJ and ISTJ are very welcome to this type of team. But to make it more balanced, it would need, when possible, to include members with a judging- dominant process and extroversion.

#### C. Programmer Role:

When building a team of programmers, we should include basically ISTJ personality types. And to compensate a group, we could use another ST type with a judging dominant process; a good election would be an ESTJ personality. Contrary to what Teague shows in Table VI, INTJ individuals would be also excellent members of this type of team due to their capacity to bring up new ideas and to their skilled abstraction.

## VI. CONCLUSIONS

In this paper, we presented a suggestion on the influence of different personality types over IT students in Project-Based Learning. MBTI is one of the most widely-used personality profiling regarding to working relationships. MBTI is a tool with intent not to stereotype, but to allow understanding of

individual preferences to facilitate all aspects of life: differences in learning and communication styles, conflict management, and relationships. As presented in the paper, previous experiences of students taking MBTI test and using PBL for several years, show that there is a relationship between result success and different member profiles. Considering this situation, MBTI could be useful for the assessment of team success, or at least for preparing to face some kind of conflicts depending on the combination of profiles.

IT projects have specific characteristics due to the intangible nature of the product. People are recognized by most experts as a key aspect within these projects. Nowadays efforts of improving IS projects are focused on teamwork aspects, mainly communication and coordination. Teamwork capability of team members and working relationships among team members, which directly affect team performance, are important for a successful project team. When staffing a team, attention should be paid in both technical as well as relational competences. Knowing more about team members' personality and how different personalities compliment or conflict one another can serve as useful information in building and leading a project team. Communication can be improved by paying special attention to differences of personalities.

IT people have MBTI combinations that are very different from general population, although remarkable similar among them. ISTJ and INTJ types are the two most common types found in this industry sector. Both profiles are very suitable for designers and programmers roles, but not the most adequate for analysts, for whom extroverted NT and NF profiles are desired. Nevertheless, an INTJ balanced in Introversion/Extroversion (i.e. 60% 40%) would be also a suitable analyst. As the surveys show, that profile is very common within IS field.

The team will be composed of all three roles: analysts, designers, and programmers. When selecting the staff, balance must be kept, including different profiles for diversity, but avoiding conflicts. This can be done choosing the right people with compatible MBTI profiles, covering both technical and relational functions. The results of this study have implications for management development and training. They can also serve as a guideline for recruiting the right team.

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