

WHO SHOULD WORK WITH WHOM?

BUILDING EFFECTIVE SOFTWARE PROJECT TEAMS

Personality type analysis can help take the guesswork out of putting together a high-performance software project team.

Software projects are plagued with cost and schedule overruns, costing billions of dollars to corporations and governments. One of the main factors contributing to such poor performance is software project team composition. Some of the team-related factors that can affect project performance are the personality composition of members, team leadership, and intrateam communication and coordination [1, 2]. It appears the human aspects of software development are more important than the technological aspects for better performance [3, 4, 9]. A small number of studies have investigated the personality composition of team members within a software project context. White conducted a field study of two teams with only two personality dimensions and found that successful teams have diverse personalities [10]. Bradley and Hebert analyzed performance of two teams using the Myers-Briggs Type Indicator (MBTI) [1]. Yellen and colleagues found that extroverts were relatively more effective than introverts in group decision making [12].

These studies, exploring the effects of personality on team productivity, had a limited focus by considering only one or two teams, or examining one or two personality dimensions. While the previous studies are insightful, they only establish the foundation for further study [10]. Moreover, previous studies were conducted on large software teams; the

results of these studies are not generalizable to smaller IS teams, which are all small- to medium-size companies can afford. Our study uses survey methodology, in contrast to the case study analyses used in most previous research. We consider four dimensions of personality and use a comprehensive team productivity measure. The objective of this study is to

find the relationship between personality composition of teams and the team performance in small IS teams. In particular, we seek to determine:

- The effect of the project leader's personality on team performance;
- The effect of team members' personalities on team performance; and
- The effect of heterogeneity of personalities on team performance.

The MBTI is used to assess an individual's personality style on four dimensions: social interaction, information gathering, decision making, and dealing with the external world. Each dimension consists

Criterion	Personality Dimension	Team Performance*	R-Square	Significance
Team Leader	Information Gathering	Intuitive > Sensing	0.297	.0130
	Decision Making	Feeling > Thinking	0.297	.0130
System Analyst	Decision Making	Thinking > Feeling	0.482	.0038
Programmer	Interaction with the World	Extrovert > Introvert	0.505	.0020
Heterogeneity Leader-Member	Interaction with the world	Extrovert~Introvert	0.181	.0612
	Information Gathering	Intuitive~Sensing	0.595	.0001
Heterogeneity Member-Member	All dimensions	--	--	Not significant

* > means outperforms, ~ means difference.

Summary results: of two possible personality Personality type and team performance. styles. The social interaction dimension categorizes a person as either an extrovert (E) or an introvert (I). Extroverts are people-oriented, sociable, and enjoy interacting with others. Introverts prefer to work alone and are less oriented toward social interaction. In the information-gathering dimension, a person can be classified as either sensing (S) or intuitive (N). A sensing person prefers to seek detailed information and actual facts, whereas an intuitive person tends to make impressions without emphasizing details and is more imaginative and futuristic. The decision-making dimension categorizes a person as thinking (T) or feeling (F). While a thinking person makes decisions based on logic and objective consideration, a feeling person bases judgments on subjectivity and personal considerations. The dimension for dealing with the external world categorizes a person as either judging (J) or perceiving (P). Judging individuals are organized and establish deadlines they expect others to follow. Perceiving individuals are rather flexible and view deadlines only as guidelines. The overall personality of a team member is classified into one category in each of the four dimensions, resulting in 16 possible personalities.

We enlisted 92 IS professionals from 20 software development teams in Hong Kong to complete a

questionnaire-based survey, and received a response rate of 97%. Both team leaders and team members were requested to complete the questionnaires. All the teams were involved in IS development for business applications. The team ranged in size from three to seven, with an average of four members. The members were asked to provide their perceptions about team performance. While there is a considerable overlap among the performance items of previous researchers [2, 3, 5], we used the comprehensive instrument of six performance measures developed by [5]. The respondents were asked to rank the amount of work done by the team (from 1 = too little to 5 = too much), the quality of work (from 1 = low quality to 5 = high quality), efficiency of team operations (from 1 = least efficient to 5 = most efficient), the effectiveness of user interaction (from 1 = least effective to 5 = most effective), the frequency of schedule adherence (from 1 = never to 5 = always), and frequency of budget adherence (from 1 = never to 5 = always). Personality type was measured with MBTI using the Keirsey Temperament Sorter, which requires respondents to answer 70 questions choosing between "a" or "b" to convey how they would feel or act in various situations.

Among the team leaders, 43% were in the age group of 31–35, 43% had advanced degrees, 57% worked in the computing field for over 10 years, and 50% of team leaders served on 4–6 teams. Among the team members, 48% were 26–30 years of age, 17% possessed advanced degrees, 60% worked 1–5 years, and 67% participated in 1–3 teams.

The Best Personality For the Job

Here we describe the most effective personality attributes for each software development team role as based on the results of our survey (summarized in the accompanying table):

Team leader personality. Our survey showed how team leaders scored on the information gathering dimension (sensing/intuitive) had a significant impact on team performance. IS teams with an intuitive (I) team leader outperformed those with a sensing (S) team leader. Intuitive types are broad-based, whole-picture-oriented concerning systems and subsystems, and have an innovative ability to create and assess alternate solutions. These are desirable characteristics of a team leader in small teams, since he or she may also need to perform the responsibilities of a systems analyst. In regard to the decision-making dimension, our results indicate that teams with a feeling (F) type team leader outperformed those with a thinking (T)

type team leader. The fact that the feeling person is people-oriented and makes decisions based on how they affect individuals may help make that personality type an effective manager. This view was supported by a statement from one of the programmers in a high-performance team who noted the open-minded stance of the team leader encouraged collaboration and team involvement, and motivated him to share his ideas since the leader was willing to accept constructive ideas from team members.

Systems analyst personality. Only the decision-making dimension (thinking/feeling) of the systems analyst personality had a significant influence on team performance. Teams with a thinking (T) type systems analyst outperformed those with a feeling (F) type systems analyst. It appears the analytical skills of a systems analyst are more important than behavioral skills in small teams. While in larger teams, the systems analyst may be primarily assigned to such tasks as requirement determination and system specification, in smaller teams the system analyst must perform multiple tasks. He or she may need to engage in system design and programming in addition to systems analysis. The thinking type personality is better suited to such a range of analytical tasks.

Programmer personality. Only the social interaction dimension (introversion/extroversion) of the programmer personality was strongly related to team performance. This finding was surprising, but teams with extroverted (E) programmers outperformed those with introverted (I) types. This may be explained by the fact programmers must interact with several parties, including systems analysts/designers, other programmers, computer operators, and data entry operators. In addition, in small project teams, programmers may also act as systems analysts and interact with various user department personnel. An extroverted programmer may be better suited for such widely ranging tasks.

We also analyzed the heterogeneity between the team leader and team members, computing heterogeneity as the absolute difference between the score of the team leader and the average score of the other team members. Two of the personality dimensions—involved social interaction (introversion/extroversion) and information gathering (intuitive/sensing)—were significantly related to team performance. Thus, the higher the heterogeneity between team leader and team member in these two dimensions, the higher the team productivity.

Our results did not show any significant impact of personality heterogeneity among team members on team performance. This result is contrary to common wisdom applicable in larger teams, where team het-

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erogeneity has been shown to have a positive impact on team performance [10]. Due to small team size, most of the members may need to participate in many phases of the system development life cycle (SDLC). For example, both the systems analyst and programmer might participate during requirement determination phase (with relatively more effort from system analyst) and programming phase (with relatively more effort from programmer). Furthermore, it is known that heterogeneous team composition is optimal for some SDLC phases (requirements determination), and homogeneous team composition is optimal for others (programming) [11]. Since team members might be involved in multiple SDLC activities, we found no significant effect of member heterogeneity.

Building Better Software Teams

Based on our survey findings, we compiled a list of recommendations for creating an optimal software team:

- Software managers should be aware that the opti-

mal personality allocations in small project teams are somewhat different than those in large teams.

- IS managers should consider selecting personnel so there is personality heterogeneity between the team leader and other team members in the social-interaction and information-gathering dimensions. Thus, the project leader and members should be selected such that all the four of these personality categories are represented: extrovert-intuitive, extrovert-sensing, introvert-intuitive, and introvert-sensing.
- It is unnecessary to have diversity of personalities among team members (excluding team leader) due to the fact that members need to perform multiple tasks of the SDLC and heterogeneity is not good for all phases [11]. This should give IS managers the flexibility needed to select members of appropriate personality, although it may be difficult for small businesses with limited resources to find desired personnel.
- The team leader may be selected such that he or she is of intuitive (N) type on the information-gathering dimension, since such a team leader will be able to visualize future information requirements better. Furthermore, the optimal personality for a team leader in the decision-making dimension is a feeling (F) type. The preferred personality type in the dimension involving dealing with external world is judging (J) [1], since it is important for the team leader to establish project milestones and make sure other members follow them.
- As with the team leader, the optimal team member personality for dealing with the external-world dimension is judging (J), since this attribute will help them meet project deadlines.
- The optimal personality for a systems analyst in the decision-making dimension is thinking (T), because a thinking person will use a scientific approach and base decisions on logical reasoning. Regarding the information-gathering dimension, a sensing (S) type system analyst is optimal, since heterogeneity between the personalities of the team leader and team members on the information-gathering dimension is desired and an intuitive team leader is preferred. Also, the practical orientation of a sensing type will be helpful in providing detailed design and programming specifications and participating in programming tasks.
- In terms of the social-interaction dimension, the preferred personality for programmers on small teams is extroverted (E). An extrovert can communicate easily with other participants in system

development. As with other team members, the desired personality types for a programmer are sensing (S) on the information-gathering dimension and judging (J) on the dimension involving dealing with the external world.

- In addition to selecting team members of appropriate personality types, IS managers should ensure that team members possess diverse expertise in IT and business applications [8] and that the mechanisms are in place to share expertise among the members [2]. Furthermore, administrative control procedures for project milestones and delivery schedules should be implemented [7]. ■

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