The effect of personality type on team performance

John H. Bradley and Frederic J. Hebert
East Carolina University, Greenville, USA

Team approach to IS development

The development of innovative solutions to complex problems has become increasingly challenging. The modern information systems (IS) development model includes the use of cross-functional teams, which comprise both users, such as accountants and salespeople, and IS professionals such as systems analysts and programmers. Team members must work together effectively to produce successful systems. In the past, IS departments perceived themselves as autonomous units that provided specific expertise to user departments. With the team approach, IS professionals are no longer autonomous but are equal members of a group of professionals, each with a specific contribution to make. Their responsibility is no longer independently to design an IS, but instead to carefully direct the users to design their own systems. Expected benefits of successful teams include increased motivation, greater task commitment, higher levels of performance, ability to withstand stress, more innovative solutions[1], and decreased development time[2]. Research is currently underway to find appropriate measures for these factors so team effectiveness can be accurately evaluated[3].

One example of the use of teams in the IS development process is the steering committee, a team composed of the heads of major departments in the organization. In one study, 71 per cent of the respondents reported using a steering committee to determine which new systems would be developed. Almost 83 per cent of these were either satisfied (66.8 per cent) or very satisfied (16 per cent) with the steering committee's performance[4]. While these results suggest the popularity of the team approach to IS planning, the finding that only 16 per cent were very satisfied with the performance is not an overwhelmingly positive evaluation of their effectiveness. If the team approach is truly preferred, as the team-building literature proposes, then one would expect a higher level of satisfaction with team performance.

Ineffective teams may be the product of inappropriate team composition. Deciding to use a team approach is only the first step. Great care must be exercised in building the team to ensure its ultimate effectiveness. There are a number of pitfalls involving group dynamics that can undermine a team's effectiveness[5]. This paper proposes a model of the impact of the personality-type composition of a team on overall team performance. The model applies personality-type theory to the team-building process and then illustrates the importance of this theory by evaluating a case example of two software development teams. One of the teams was considered to be very productive by

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management, while the other team's performance was judged to be unsatisfactory. The purpose of this paper is to highlight the impact of personality type on team productivity and to propose a model that can be used to analyse the personality-type composition of an IS development team.

Since only two teams are compared in the case example, statistical analyses are not possible. However, this particular case is valuable because it clearly demonstrates the influences of personality type on two teams that are comparable in age, IQ, problem-solving ability, gender, and task responsibility. The task of IS development is appropriate to the discussion because it is of such relative complexity, especially with the use of multi-functional teams, that its successful accomplishment requires a high level of harmony among the team members.

The following sections discuss the influence of personality-type composition on team performance. First, four critical factors are discussed in the context of successful IS development teams, followed by a discussion of personality types using Jungian psychological-type theory as a framework. A theoretical model of preferences for team composition is then derived by applying personality-type theory to the four factors. The influences of personality type on the two illustrative software development teams' performance are discussed and several conclusions and recommendations are presented concerning team personality-type composition and its influence on team performance.

Critical factors for effective teams

An increasingly popular example of the team approach to IS development is joint application design (JAD), a well-documented method for operationalizing user involvement. JAD is intended to shorten design time while promoting comprehensive, high-quality results[6,7]. JAD is an example of representative design which involves user representatives in the decisions required to formulate an IS. One of the basic dimensions of team effectiveness involves individual differences[8,9]. The ideal team should be highly diversified in the talents and knowledge each member contributes, while maintaining open, non-threatening communication. JAD has been a popular topic in the IS literature which points out several critical success factors that are related to individual differences. A brief discussion of JAD will help put these success factors in the context of team performance.

JAD refers to the inclusion of members of the user departments along with the IS specialists on the development team. The users participate in the information system design, giving them a critical sense of ownership in the new system. The resulting system is usually of higher quality since the users are more familiar with the environment in which the system is expected to operate. For example, a JAD team formed to develop a computerized accounting system would be comprised of accountants as well as computer specialists.

From the JAD literature, three characteristics of productive teams that are strongly related to individual differences seem to dominate: effective leadership, intra-team communication, and group cohesion[3,6,10-12]. Although all three of these characteristics are at least partially dependent on the personality types of

the individuals involved, personality is rarely directly included in the discussions. Information directly concerning the effect of personality type on team building is best found in the psychology literature. The dominant factor there concerns the mix of personality types and how the different types interact to effect team performance[8,13,14]. These four dominant individual difference characteristics of productive teams can be combined, based on the common thread of personality type, to form an evaluative model of the impact of personality type on team performance. The following is a discussion of the four factors from the perspective of this model (Figure 1).

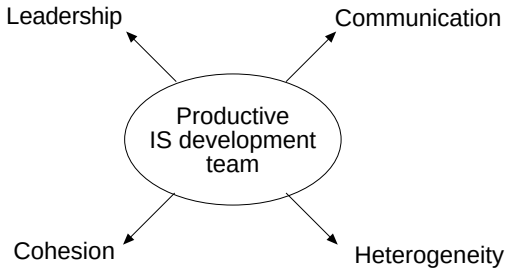

Figure 1.
Influential factors in team productivity

Effective *leadership* is an especially important factor in the success of an IS development team. Ineffective leadership will sabotage team productivity[1,12,15]. A knowledgeable, assertive leader must not only be available and properly trained in group dynamics techniques, but must also be the type of person who can lead people who represent different functional areas and different levels of management. They must control the team meetings, persistently drawing everyone into the discussions until a consensus is reached[16]. Often, good team leaders are hard to find. Not everyone has the right combination of technical skills and personality type to be effective. The leader must also be able to keep the team on track and quickly resolve conflicts[15]. These qualities suggest a person who is aware of the different personality types and how each type influences overall team performance.

Intra-team *communication* is another critical factor that influences IS development team success. A problem with intra-team communication may manifest itself in several ways. One development team worked for nearly five years getting to the early test phase of a policy service system for a Canadian insurance carrier. The initial test revealed that a $25 million investment in new hardware would be necessary to meet the system performance goals. After an investigation, upper management assigned the blame to the lack of communication among the departmental representatives on the team[10].

Cohesion has also been identified as a crucial ingredient in team effectiveness[3,16]. A cohesive team will demonstrate a spirit of togetherness and support for one another that helps team members quickly resolve conflicts

without residual hard feelings. Political problems are often a symptom of lack of cohesion. Team members must be able to empathize with one another in order to avoid political infighting[10]. As the level of cohesion increases, the level of conformity to group norms also increases[17]. This is a positive trait as long as the group norm is not in conflict with the norms of the organization.

The personality type heterogeneity of IS team members is the fourth factor. A number of researchers have discussed the influence of team heterogeneity on successful group performance (e.g. 9,13,14,18,19]. In general, their research concludes that for complex problem solving, such as IS system development , teams made up of different types of individuals with a variety of skills, knowledge, abilities and perspectives are more effective than groups that are more homogeneous. In other words, diversity in skills and knowledge combined with a balance of personality types is desirable for effective teams.

As discussed in more detail in the following sections, certain personality types are more accepting of others and more willing to consider different perspectives. Certain types are risk-averse while others are stimulated by risk-taking. Certain types are motivated by the challenge of an unsolved problem, while others are easily overwhelmed and slip into inaction. Certain types make natural leaders while others are more comfortable as followers. Certain personality types are natural communicators while others find it very difficult to express themselves. Each personality type, however, has a positive contribution to make to the overall effectiveness of the team, therefore a balance of personality types should be sought.

There are many other factors critical to team effectiveness; however, these four are sufficient to reinforce the point that successful teams are not developed in a haphazard manner. In order to discuss personality type further, a framework is needed to identify the different types and to provide information on how they interact. The Myers-Briggs Type Indicator (MBTI), which is based on Jungian psychological type theory, is proposed as a framework to discuss personality types and their potential influence on team effectiveness.

Personality type theory

Personality type theory is founded upon the work of Jung[20]. Katherine Briggs and Isabel Myers Briggs developed a psychometric instrument, the Myers-Briggs Type Indicator (MBTI), using Jung's theory of psychological types. The MBTI is intended to be an inventory of basic preferences rather than a measure of traits[21]. It is a forced-choice, self-report instrument, designed for administration by qualified professionals and intended for use with normal subjects[22]. The instrument has been tested extensively for validity and reliability[21,23,24]. It has become the most widely used instrument for non-psychiatric populations and has been used extensively in business[25].

According to personality type theory, individuals are predisposed to one of four preference alternatives in their behaviour:

(1) how a person is energized – designated by extrovert (E) versus introvert (I),

(2) what information a person perceives – designated by sensing (S) versus intuition (N),

(3) how a person decides – thinking (T) versus feeling (F), and

(4) the life-style a person adopts – judging (J) versus perceiving (P).

Extroverts versus introverts

Extroverts are energized by interacting with other people, while introverts are renewed by being by themselves. Extroverts prefer the outside world of people and things, while introverts enjoy the inner world of concepts and ideas[26] (Table I).

Extrovert	Introvert
external	internal
outside thrust	inside pull
blurt out a comment	keep in comments
breadth	depth
involved with people, things	interested in ideas/thoughts
interaction	concentration
action	reflection
do-think-do	think-do-think

Table I.
Words used to describe extroverts and introverts

Sensing versus intuition and thinking versus feeling

An important aspect of Jung's theory as proposed by Myers[27] is the grouping of the information intake (S versus N) and the decision-making functions (T versus F). Myers proposed two sets of dichotomous functions by which individuals prefer to perceive information and process that information in order to reach decisions – intuitive-thinkers (NT), intuitive-feelers (NF), sensing-thinkers (ST), and sensing-feelers (SF). Figure 2 illustrates the two opposite types of perception (sensing versus intuition) and judgement (thinking versus feeling).

Each person has a preferred function by which information is perceived (S or N) as well as a preferred function by which decisions are made (T or F)[28].

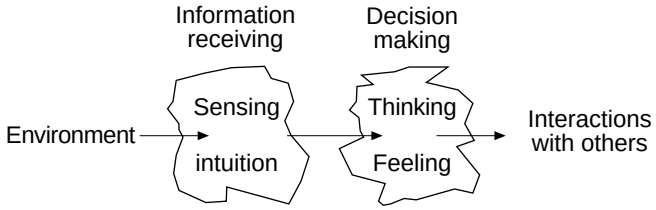

Figure 2.
MBTI model of information perceiving and decision making

Sensing (S) individuals perceive information by means of their sense organs. They prefer data that are factual, precise, concrete, and practical – hard data that deal in specifics. Attention is focused on currently known facts in a situation. Further, sensing individuals tend to break every situation down into isolated pieces. A sensing orientation is typified by a specialist who likes to develop a single idea in depth[29]. About 75 per cent of the population in the USA prefer an S orientation[19].

Intuitive (N) individuals mediate perceptions so that data are received as a whole, through a set of associations. Intuition is applied to explore the unknown and to sense possibilities and implications that are not readily apparent[30]. The intuitive function permits an individual to seek alternative interpretations and implications within data and, moving beyond the objective facts, to make comparisons with other situations. An intuitive orientation can be typified as a generalist who prefers to develop many alternative ideas rather than dealing in specific facts and solutions to problems[29].

Thinking (T) individuals use a logical, analytical process to lead to rational judgements or decisions. Thinking stresses logic and formal methods of reasoning. Personal factors are not considered in the thinking function. A thinking individual seeks to define alternative courses of actions, the consequences of each possible course of action, potential costs and benefits of each alternative including the consequences of no action, and to select the best alternative[31]. A thinking orientation can be typified by a scientist who is concerned with matters of truth and rationality.

Feeling (F) individuals focus on making judgements or decisions based on personal and subjective values. The feeling function is a mode of decision making which is not logical, but is concerned with ideas of ethics and justice. Feeling involves consideration of a decision in personal terms – the personal stakes of individuals and groups who will be affected by the decision. In decision situations, the feeling individual assesses the values involved for each alternative, how people will react and whether the likely outcome will enhance outcomes for individuals and groups. A manager who develops personal and caring ties with subordinates and appreciates their contributions typifies a feeling orientation. An F orientation is preferred by about 65 per cent of females in the USA[28]. A number of characteristics associated with each of the four functions are shown in Table II.

Judging versus perceiving

The final two personality types relate to an individual's preference for their relationship with the outside world[9]. Judgers prefer to live in a planned, orderly, decided way. They prefer to carefully regulate and control their lives. Perceivers prefer to live in a flexible, spontaneous way. They seek to understand life and adapt to it. Table III presents a list of words used to describe the judging and perceiving personality types.

Myers[9] and Kroeger and Thuesen[8] suggest that diversity of psychological types results in successful group performance. They suggest that a typologically diverse team may take longer to accomplish a project, but the end result will always be better. Some examples of how opposing types help the group process are as follows. Extroverts (Es) help open up lines of communication between group members, while introverts (Is) provide internal reflection of group discussions. Sensing (S) types bring up pertinent facts and "what is", while intuitive (Ns) types bring up new possibilities and provide ideas of "what might be". Thinking (Ts) types present a logical analysis of the decision-making situation, while feelers (Fs) offer insights into how feelings of other group members and customers might affect the situation. Judgers (Js) help keep the team on schedule, while perceivers (Ps) help the team consider other alternatives in the decision-making process.

Information receiving		Decision making	
Sensing	Intuition	Thinking	Feeling
Details	Patterns	Scientific	Alogical
Concrete	Hypothetical	Justice	Harmony
Practical	Imaginative	Objective	Caring
Facts	Innovations	Impersonal	Personal
Directions	Futures	Rational	Empathize
Depth	Variety	Precise	Subjective

Source: adapted from [29,31-33]

Table II.
Description of the information-receiving and decision-making types

Judging	Perceiving
Planned	Spontaneous
Regulate	Flow
Control	Adapt
Settled	Tentative
Run one's life	Let life happen
Set goals	Gather information
Decisive	Open
Organized	Flexible

Source: adapted from [26]

Table III.
Description of the judging and perceiving types

The combinations of the four types produce 16 different personality types. Kroeger and Thuesen[8] and other MBTI researchers suggest that life's natural administrators are the ESTJs, while life's natural leaders are the ENTJs. The success of either type would be partially dependent on the situation. If a more complex, creative solution is needed, the ENTJ might be preferred, and if the situation is hands-on and practical, the ESTJ might be preferable. As

organizations become more concerned with teamwork, it is apparent that they must be aware of how different personality types influence the way workers interact with one another. Personality-type theory is important in understanding each person's strengths and weaknesses and the way these factors influence team formation and development.

A model of the effect of personality type on team performance

The initial model (see Figure 1) can now be enhanced by applying personality-type theory to the four factors of team performance. In general, the best leader is an ESTJ or an ENTJ, depending on the task involved. The extroverted leader will readily communicate directions and organizational information. If the IS being developed is an enhancement to an existing system or if it is concerned with a highly structured problem that does not require the application of new technologies, the sensing leader should do best. If the new IS requires the creation of new approaches to a problem that may not be easily understood, then the intuitive leader should function best. (See Figure 3.)

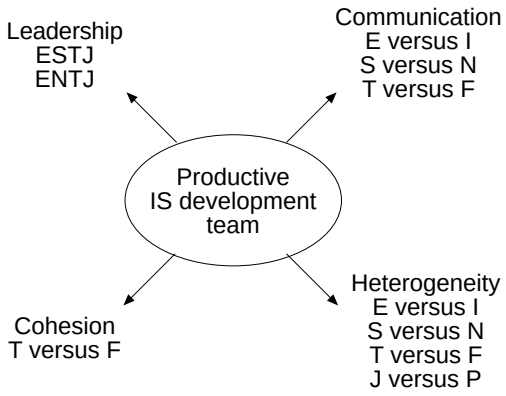

Figure 3.
A model of the impact of personality type on team productivity

Intrateam *communication* will be more natural for the extrovert than the introvert, the sensing than the intuitive, and the thinking than the feeling personality types. Extroverts are natural communicators. In fact, too many extroverts can result in confusion as they interrupt each other to express their views. Sensing types perceive the facts and can easily organize their thought for communication to the other team members. Intuitives tend to develop more complex ideas that are more difficult to communicate. Thinking types are prone to making quick judgements and immediately verbalizing their thoughts while feeling types may not express their true thoughts in order to avoid hurting someone's feelings. The effective team should have a healthy component of extroverts to ensure sufficient intra-team communication.

Cohesion is affected most by thinking versus feeling. The thinking team members, in their haste to express their judgements, often offend the more sensitive team members creating hard feelings that drive an emotional wedge between them. The feeling member, on the other hand, will be constantly aware of the *esprit de corps* and do what they can to maintain harmony. Cohesion does not mean the absence of conflict, for it is in conflict that ideas are evaluated for their true contribution. A cohesive team is one that is able to resolve conflicts in a manner that does not result in lasting divisions, but instead results in the synergism that makes team work valuable.

Team *heterogeneity* refers to the number of each personality type on the team. In general, each type has something positive to contribute. In fact, usually a large degree of psychological homogeneity causes problems. While the homogeneous team may reach consensus faster, the results will not be as innovative as they will be with a more heterogeneous team. In IS development, each personality type should have roughly equal representation.

This model is a compilation of ideas into one representation of an "ideal" team. Although it would be unrealistic to expect every IS development team to be ideal, the model is useful in providing a standard by which teams may be evaluated. In that vein, the following section illustrates the use of the model to evaluate two IS development teams that varied in both team composition and productivity.

A case example

This section presents a case example of two IS development teams that demonstrated a noticeable difference in productivity. Since only two teams were studied, the conclusions cannot be scientifically generalized to all teams. This particular comparison does, however, serve as an excellent illustration of loss of productivity due to a poor combination of personality types.

A medium-sized software development company in the Southeastern USA makes extensive use of teams in the development of IS software. Company management noticed a distinct difference in the productivity of two major teams. The two teams were given assignments of developing information systems of comparable complexity, yet team 1 took almost twice as long (two years) as team 2 in the development process and produced an IS of only moderate quality as reported by the users. The user department was not satisfied with the system and immediately began to demand revisions. Team 2 on the other hand finished their project ahead of schedule and produced a high quality system. Management noticed that the members of Team 1 did not communicate well (misunderstandings as well as failure to communicate) and seemed to have great difficulty getting organized. Numerical ratings of the performance of the two teams are not available. However, management closely monitored the two teams throughout the duration of both projects and were emphatic concerning their impressions of the teams' performance.

A set of descriptive data was collected to identify team similarities and differences. Although some statistical analyses are reported, due to the small

sample size an extensive statistical analysis was not possible. Table IV presents the results of a psychometric analysis of the two teams.

All team members participated in a series of psychometric evaluations that revealed very little difference in the average team composition except for personality type differences. Table IV shows the individual scores as well as the team averages. The average age of the two teams was approximately the same with the same level of education (college graduates). There was one fewer male than female on both teams. Both teams had approximately the same problem-solving skills (team 1 = 66.3; team 2 = 67.5; insignificant difference, $p > 0.65$) as measured by the Watson-Glaser Critical Thinking Appraisal, a measure of their general cognitive ability. Although team 2

Critical thinking	IQ	Age	Preferences	E	I	S	N	T	F	J	P	
Team 1 (ineffective team)												
72	28	36	ENTJ	20	6	11	17	21	3	23	9	
53	18	27	ENTJ	19	8	11	11	11	5	18	9	
71	29	40	INFP*	9	18	4	23	11	14	8	22	
50	25	24	INTJ	16	9	11	16	16	7	20	9	
73	36	30	INTJ	7	18	9	12	10	9	20	9	
72	24	29	ISFP	4	23	16	6	4	15	12	15	
76	30	33	ISTJ	8	20	13	8	12	6	15	11	
69	26	39	ISTJ	11	18	16	8	17	5	17	10	
61	22	25	ISTP	13	15	16	12	30	3	4	25	
66.3	26.4	31.4		12	15	12	13	15	7.4	15	13	Average
				107	135	107	113	132	67	137	119	Sum
Team 2 (effective team)												
59	24	37	ENFJ	16	12	6	15	9	9	18	11	
75	38	42	ENFJ	23	3	9	12	6	15	17	9	
71	31	26	ENTJ	18	11	7	18	24	3	20	7	
70	28	36	ENTJ	17	13	1	20	14	5	20	6	
62	27	27	ESFJ	23	5	24	2	8	12	17	7	
73	23	40	ESFJ*	22	6	22	1	4	14	17	10	
71	25	24	INFJ	13	14	10	12	2	15	18	8	
71	34	46	INTJ	8	21	8	10	17	5	18	9	
69	33	27	INTJ	10	19	11	14	17	2	19	8	
68	29	39	INTJ	6	21	0	22	12	7	20	10	
58	17	24	ISFJ	12	16	23	4	7	10	20	9	
67	32	42	ISTJ	9	18	16	6	14	7	27	1	
63	36	26	ISTJ	11	12	18	6	20	5	19	7	
67.5	29.0	33.5		14	13	12	11	12	8.4	19	7.8	Average
				188	171	155	142	154	109	250	102	Sum

Table IV.
Psychometric analysis of IS development teams

Note: *= team leader

demonstrated a slightly higher IQ on the Wonderlic Personnel Test, the difference was not statistically significant (team 1 = 26.4; team 2 = 29.0; insignificant difference, $p > 0.59$).

If the teams were not different in terms of demographics and basic ability levels and were performing comparable tasks, then why was their performance so different? Could the personality-type composition of the two teams explain differences in team performance? The MBTI was administered to the two teams and differences in the team members' personality types were analysed.

Personality-type composition and team performance

The previously cited literature revealed several factors that are thought to produce effective teams, such as strong leadership and effective intra-team communication. In this case example, the two teams were judged to be different in their performance level. Team 2 performed at a higher level than team 1. Since other analyses of the two teams did not identify any significant differences in the abilities of the two groups, the MBTI types of the two groups were analysed to identify potential differences in personality type.

First an analysis of the two team members' types is presented and then the influences of the type differences are discussed. Table V presents an analysis of the MBTI composition of the two teams. Although cell sizes were not large enough to perform an appropriate statistical analysis, there were a number of noticeable differences between the two teams.

It is important to have diversity and balance in the personality types of various group members[8]. As we can see from an analysis of the two teams, except for judgers and perceivers, team 2 (the more successful team) is much more well balanced than team 1. For example, team 1 has 80 per cent introverts and 20 per cent extroverts compared to team 2's equal percentage of 50 per cent of both types. Kroeger and Thuesen[8] note that, in team situations, introverts

MBTI type	Team 1 (less successful) Number	Percentage	Team 2 (more successful) Number	Percentage
Extroverts	2	20	7	50
Introverts	8	80	7	50
STs	3	30	3	21
SFs	1	10	3	21
NTs	5	50	5	36
NFs	1	10	3	21
Judgers	7	70	14	100
Perceivers	3	30	0	0

Table V.
Analysis of MBTI differences

often tend to keep information to themselves and are less communicative in meetings. Team 1's large percentage of introverts may have inhibited successful intra-team communication.

Team 2 also had a better balance in the type combinations of information intake (S/N) and decision making (T/F). The combinations are particularly important to effective teams because much of a development team's work relates to receiving and processing information to make decisions about the particular system being developed. The percentages of S versus N were comparable, with team 1 having 60 per cent Ns and 40 per cent Ss, while team 2 had 57 per cent Ns and 42 per cent Ss. Kroeger and Thuesen[8] note that S types may have difficulty understanding what team building has to do with the business at hand because they see work as being more of an individual task. Sensing types like to focus on the details and may tend to miss the larger picture. Intuitive types may love the concept of teamwork but may have difficulty putting the concept into action. They are much more comfortable envisaging the larger picture and theorizing about what the system will do than with getting busy on the details of putting the system together.

There was a major difference in the T versus F make-up of the two groups. Team 1 had only had 20 per cent Fs (2 persons), while team 2 had 42 per cent F types (6 persons). Kroeger and Thuesen[8] note that the difference between thinkers and feelers can cause major problems for effective team building. Thinkers are primarily concerned with accomplishing the task, while feelers are concerned with how well people work together. If the team gets the job done but in the process the individuals end up not speaking to each other, has the venture been successful? This basic difference in task versus people orientation suggests that the T/F difference is among the primary influences on a team's *esprit de corps*. They suggest that a successful team is one that balances task orientation (the T type) with the feelings of group members who are accomplishing that task (F types). Kroeger and Thuesen[8] also note that F types tend to be weeded out in the process of developing managers, so even finding F types in organizations can be a major challenge. In the case example noted here, a major reason for team 1's lack of success could have been caused by the preponderance of Ts who pushed ahead to complete the task while giving less attention to user needs as well as the needs of other F types on the team. Team 2's high percentage of F types could have facilitated more attention being given to user needs and the feelings of other team members.

Team 1 had a better balance of J and P types (70 per cent J, 30 per cent P) than team 2 (100 per cent J). However, Kroeger and Thuesen[8] suggest that too much diversity may actually inhibit successful team performance. They suggest that the J/P difference, at least on the surface, is the key to team success or failure. Js have a need for closure, to move on to other important objectives, while Ps have an unceasing need to consider other alternatives

and to make seat-of-the-pants assessments. The negative influence of too many Js would be that, in their rush to stay on schedule, they might not carefully consider all of the potential alternatives. In contrast, Ps have difficulty staying on schedule because they are taking so much time to consider all the alternatives. In a complex process such as developing an IS system, there could be many alternatives to consider that would slow down the decision-making process. Therefore, as long as team 2 considered all of the alternatives carefully, they would probably be more apt to stay on schedule than team 1.

Some team members prefer to approach problem solving in an orderly, systematic manner while others prefer less structured approaches[34]. Team members with opposing preferences will have great difficulty avoiding conflicts in their communications. Procedural order preference would be most influenced by the T and F personality dimensions and the J and P constructs. The T types would be focused on getting the specific jobs done, while the F types would be more concerned with group harmony, which could cause problems in deciding how to proceed on the project. Team 1, which was composed of a large percentage of T types, may have raced ahead to get jobs done without everyone being on board, while team 2's larger percentage of F types may have helped them focus more attention on group harmony. The J and P dimensions would definitely influence procedural order preferences. As discussed earlier in this section, Js would want to stay on schedule at all costs, while Ps would want to consider all of the alternatives before proceeding. Team 1 (the less successful team) was composed of several P types.

As discussed earlier, leadership is an important component of JAD teams. In the case example, the unsuccessful team's (team 1) leader was an INFP type, while the successful team's (team 2) leader was an ESFJ. The two leaders differ on three of the four preferences, and team 2's leader has many characteristics that would reinforce successful group performance. Team 1's introvert leader may have withheld information and sought to shorten meeting times because being with people drains an introvert's energy. The large number of other introvert team members may have also been less involved in group communication. Team 2's extrovert leader may have been more effective in stimulating group communication and in involving all group members in the process. Team 1's intuitive (N) leader may have been in favour of the team concept, but unable to transfer that support from theory into action. In contrast, team 2's sensing (S) leader may have been more effective in keeping the group on task. Team 1's feeling (F) type leader may have clashed with the large percentage of group members who were thinkers (Ts). This F leader may have been focusing more attention on group harmony rather than getting the job done, which could have frustrated the T types. In contrast, while team 2's leader is also an F type, there were a larger percentage of F types on the team who could offer support for the leader in emphasizing group harmony as an important factor. Team 1's leader was a perceiver (P), a person who has difficulty in obtaining closure on important issues to move on to other

important tasks. Team 2's leader was a judger (J), which was consistent with the other team members.

Intra-team communication has been discussed extensively in this section in the analysis of differences in the team members' personality-type composition. In summary, team 1's large percentage of introverts, thinkers and perceivers may have resulted in less-effective group communication, while team 2's large percentage of extroverts, feeling types and judgers may have facilitated group communication.

Based on the analysis presented in this section, team composition of personality types does appear to be an important explanatory variable for differences in team performance. The literature and this case example suggest that in general, diversity and balance in team member personality types is needed to produce successful team performance. The results of the analysis presented in this section indicates that team 2's greater balance of extroverts and introverts, sensing types and intuitive types, and thinking and feeling types appears to have influenced successful team performance. Team 2's large percentage of judging types also ensured that the project was completed in a timely manner.

Conclusion and recommendations

Cross-functional teams are beginning to play an important role in the quest for innovative solutions to today's complex problems. As these problems become increasingly complex, the effectiveness of the teams will become more important. The case example of IS development teams presented here suggests that personality types are an important factor in successful team performance. Organizations that desire to develop effective teams need to analyse the personality-type compositions of these groups and help team members understand their own personal attributes as well as appreciate the contribution of the other team members. The model presented in this paper is a valuable tool in accomplishing this analysis.

Kroeger and Thuesen[8] pose the following questions to consider in analysing teams using the MBTI:

(1) Does the team have the best types of people to get the job done? The type of job being done should have some influence on the types of people who are selected to be on a team. Our case example suggests that for such complex tasks as IS development, a balanced team of opposing personality types is needed. The more complex the task, the more important the balance.

(2) Are the right jobs within the team being done by the most effective types of people? In other words, is the personality type of each team member compatible with the requirements of the area of responsibility? Are they using their abilities most effectively by being in the place where their contribution will make a difference? Of particular importance in a team situation is the team leader. This case example suggests that personality

type should be strongly considered when choosing the team leader. Team leaders should demonstrate the personality-type preferences that enable them to involve others in team communication, to be sensitive to the needs of all team members, and to keep the team on schedule to complete the task.

(3) How will the team evaluate progress towards its goal? This question suggests a balanced diversity of all types on the team, particularly judgers, perceivers, feelers, and introverts. Judgers help keep the team on schedule, while perceivers ensure that multiple options are considered before proceeding ahead. Feelers ensure that someone's idea is not dismissed out of hand and that group harmony is considered in making decisions. Introverts are needed to offer internal reflection of what items are being communicated orally in a meeting. They need time to think through what has been discussed and to give their opinions before decisions are made.

(4) Is there a team type that can effectively determine when the project is completed? Often, a list of enhancements has been suggested before the information system has been completed. When should development stop and implementation begin? Such personality types as extroverts, intuitives and judgers are particularly helpful in answering this question. Extroverts prefer to get issues out in the open so they can be discussed and resolved. Regardless of whether the project has been a success or a failure, they can help bring the issues out in the open. Intuitives provide a holistic view of the entire organization and provide their perceptive assessment of whether the system is doing what it was intended to do. Judgers help keep everyone on track and offer their assessment of whether the task has been completed.

In summary, this model offers important insights into the influence of personality-type composition on team performance. It is important for the IS manager to remember that the MBTI measures preferences. Individuals can adopt other personality types if they are aware of personality-type differences and make a concerted effort to change. However, these individuals will need to be monitored very carefully.

We propose that IS development team performance is at least partially related to the team's personality-type composition. The case example illustrates this relationship and not only highlights interesting areas of future research but also serves as a reminder to managers to consider carefully personality type in determining team composition.

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