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A Comparison of Myers Briggs Type Indicator Profiles and Belbin Team Roles

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Abstract

As greater organisational interest is being focused on the linkage between teamworking and performance there is an increasing interest in the composition of teams in terms of the roles of team members.

A recent survey (Employment and Development Bulletin 1995) has indicated the dominance of two Team Roles Models in commercial applications of team selection and development. These models are those developed by Belbin and Margerison and McCann. Whilst Belbin's model has been relatively extensively researched there is less evidence available to support the Margerison & McCann model. Both models are derived from differing personality instruments (Belbin from the 16PF and Margerison & McCann from the Jung Type Survey). The role descriptors in both models, however, appear broadly similar in terms of characteristics and expected behaviours. In addition to specific team role models much of the team development literature highlights the potential value of the Myers Briggs Type Inventory (MBTI) in team building. This instrument is closely related to the Jung Type Survey and raises the possibility that there could be a relationship between the profiles produced and the Belbin Team Roles (BTRs).

A study of the results from a development centre conducted for manages in a life assurance company was used to explore the associations between MBTI profiles and BTRs.

The study used 16PF scores, Watson-Glaser Critical Thinking Appraisal scores and MBTI profiles for centre participants as a basis of comparison.

Results from the study indicated some associations between MBTI scales and six of the eight BTRs. Subsidiary analysis of BTR's and associations based on using the CTA in place of 16PF Factor B in the team role calculation is considered in the light of previous research and indicates the value of further research to develop a more complete understanding of BTRs.

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The fact that the study was conducted in a single organisation, combined with a number of methodological constraints, limits the confidencewith which conclusions may be drawn. However, the potential value of further research to explore relationships in more detail would appear to be indicated by this study.

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A Comparison of Myers Briggs Type Indicator Profiles and Belbin Team Roles

1. Introduction

The role of teams and their contribution to organisational performance is a dominant topic in much of the current management literature. There is a strong impression given that teams and teamworking are "flavour of the month" and are being viewed as the solution to many pressing, and often complex, issues relating to organisational performance (West 1994, Industrial Society 1995, West and Slater 1995).

There does not appear to be a single factor driving organisational interest in teams (Employment Development Bulletin 1995). The motivation for growth in interest in team working tends to be complex and associated with a range of factors including:

i) Complexity of decision-making in a volatile business environment (Tjosvold 1991, Moss-Kanter 1993, Margerison & McCann 1990, Belbin 1981, Ghoshall and Bartlett 1995).

ii) Environmental changes, including de-regulation and the increase in globalisation of business (Ulrich and Lake 1990, Towers Perrin 1992, Ghoshal and Bartlett 1995, Ray & Bronstein 1995, Phillips 1992).

iii) A need for effective strategies and tactics for implementing and managing change (Ulrich and Lake 1990, Beer et al 1990, Seddon 1992, Senge 1990).

iv) Supporting or facilitating the introduction of new organisation designs and associated ways of working (Porter 1985, Handy 1989, Senge 1990, Stewart 1990).

Overall it may be inferred that these factors are all ultimately concerned with the achievement of competitive advantage. In a survey, conducted for IBM by the consulting firm Towers Perrin, effective

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teamworking was identified as being one of the top five priorities for achieving competitive advantage in the year 2000 (Sparrow, Schuler and Jackson 1994).

Given the importance ascribed, by organisations, to teams and teamworking it is necessary that rigourous evidence of the effectiveness of teamworking in delivering improved performance and related organisational benefits should be available to underpin significant organisation decisions.

In practice, the realisation of expected benefits and performance improvements is difficult to achieve. A survey of 100 UK organisations in 1995 which examined teamworking practices found a high degree of consensus amongst participants that it is difficult to build teams and realise the benefits of teamworking (Employment Development Bulletin 1995).

Much of the evidence to support the benefits of teamworking is said to be rooted in group research (Katzenbach and Smith 1993, Ray and Bronstein 1995, Tjosvold 1991). However, the direct evidence relating to the study of teams per se tends to be primarily derived from case studies and anecdotal illustration. A clear need for empirical and organisationally-based research into teams has been highlighted by a number of authors (Furnham et al 1993, West and Slater 1995, Dulewicz 1994, 1995, Dulewicz and Life 1986).

Within the broad field of teams and teamworking one of the aspects to have been examined most extensively is that of team roles. Indeed one of the most rigourous and extensive studies of team building and effectiveness was conducted at Henley Management College over a nine-year period beginning in 1969 (Dulewicz 1995). This study culminated in the formulation of the Belbin Team Role model (Belbin et al 1976). This model has been widely used in a variety of settings and, more recently, subject to further academic study and analysis. The results of recent studies have, by no means, been consistent in supporting the constructs underlying the model with some (Furnham et al 1993, Berry 1995) challenging the constructs; whilst others (Dulewicz 1995, Senior 1995, Fisher et al 1994) have produced evidence supportive of its underlying validity.

Within the literature there are a range of team role models which attempt to describe team building and performance in terms of the nature of roles of team members and the mix of these roles. The only

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model, from amongst these, which appears to have attracted commercial interest and support coming close to the level of the Belbin model is the Team Management Index (Margerison and McCann 1985). This model is stated to be based on a socio-psychological approach which attempts to link the behaviour exhibited by a person with their functional role (Margerison & McCann 1990). The Team Roles produced by this model are remarkably similar to the Belbin Team Roles, although the approach to their identification, in terms of the influence of individual preference, is informed by the thinking of Jung (1921). Whilst being a considerable commercial success (the Team Management Index is stated to have over 200,000 managerial users [Berry 1995]) the Team Management Index data has not been made available for academic investigation or scrutiny.

Although team role models have not been developed as selection instruments, the survey reported in the Employment Development Bulletin (1995) showed relatively significant levels of usage of the Belbin Team Role model for selection for both team membership and leadership (16.1% and 17.6% respectively). The use of the Belbin model for such purposes is counselled against due to the nature of the constructs and issues which it sets out to address (Dulewicz 1995, Furnham et al 1993, West & Slater 1994, Senior 1995). This trend in the dominance of the use of team role models in organisational practice underpins the need for further investigation into their underlying structure and validity.

As one contribution to the development of a greater understanding of the value of team role models, this paper sets out to examine the extent to which apparent commonality implied in descriptors employed in different models is likely to be borne out in practice. Thus, if it can be shown that the models are sharing common constructs, the process of subsequent further validation may be more clearly focused.

For this purpose the two apparently most commonly used models (Belbin Team Role and the Team Management Index) have been selected. There is an extensive amount of data and research available on the Belbin Team Role Model. The same is not true in respect of the Team Management Index (Berry 1994). However, the impact on the Team Management Index of Jungian thinking (Margerison & McCann 1985, 1989, 1990, Berry 1994) does suggest that there is a potential linkage between the profiles produced by the Myers Briggs Type Indicator and team roles as utilised in the Team

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Management Index. Therefore, this paper specifically sets out to examine the relationships between the Myers Briggs Type Indicator and the Belbin Team Roles Model.

2. Team Roles and Models

2.1 Belbin Team Roles Model

The effectiveness of teams and their structure has been the focus of much managerial research. A considerable amount of this research has been focused on the role of the team leader and their associated qualities (Adair 1986, Woodcock 1989). In broad terms this research had been inconclusive and produced individual leadership profiles which represented an "impossible and contradictory `ideal' leader profile" (Margerison & McCann 1985). The work in the area of group research has shown a distribution of contributions within an effective group (Benne & Sheats 1948) and it is, no doubt this combination of diverse individual contributions which underpinned the thinking and work of Belbin and his associates in their pivotal study at Henley, which led to the emergence of a team role model.

According to Belbin (1981) a team role is a cluster of related characteristics which comprise second order factors. Within this context they are what Cattell et al (1970) called second-order criterion factors, such as creativity, derived from research on groups of individuals known to be highly rated on the criterion in question. The original Henley research into team roles, indeed, began with the use of Cattell's `creativity' equation for identifying managers who would ultimately be clarified as Plants (Belbin & Life, 1983).

In the early stages of the Henley research not only creativity, but also other 16PF second order factors were used as a basis for the formulation of teams for the purposes of the investigation. The early results did demonstrate that correlations, for managerial level team members, were found with some 16PF second order factors (Belbin et al 1976, Berry 1994) and that the two widely researched and accepted characteristic scales were:

i) Extraversion versus Introversion; and

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ii) Stability versus Anxiety.

From these two categories four components could be identified which are:

i) Stable Extroverts

ii) Anxious Extroverts

iii) Stable Introverts

iv) Anxious Introverts

The outcome of the initial research was that effective performance of managerial teams required the presence of a mix of eight team roles which were identified as being:

i) Plant:
highly imaginative, experimental, intelligent and assertive

ii) Implementer (Company Worker):
tough minded, practical, conservative, trusting, conscientious and controlled

iii) Monitor Evaluator:
intelligent, shrewd and serious minded

iv) Completer (Finisher):
emotional, conscientious, apprehensive, tense and self-controlled

v) Resource Investigator:
calm, mature, socially bold, imaginative, radical thinking, trusting and extrovert

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vi) Team Worker:

outgoing, trusting, humble and group dependant

vii) Co-ordinator (Chairman):

practical, trusting, conscientious, controlled, emotionally stable

viii) Shaper:

tense, intelligent, suspicious.

A more detailed description of these roles is provided in Appendix I.

Although this team role model was found to explain variances in team performance in the Henley study it was reported that up to 30% of team members had no clear team role (Belbin 1981). In subsequent commercial application of the research model Belbin identified a ninth role, that of Specialist. There is no published research evidence to support this role and no clear formula to inform its calculation. From a review of its overall description (Belbin 1993) it does appear to be related to 16PF second order factors which indicate an anxious introvert profile.

Belbin's original work to develop the team role model used a combination of Cattell's 16PF instrument, the Watson-Glaser Critical Thinking Appraisal test and structured observation using the Bales Observation Categories (Bales 1950). However, much of the subsequent commercial application and structured studies focus on the use of the Belbin Team Role Self Perception Inventory (Furnham et al 1993, Berry 1994, Senior 1995). These studies have, generally, questioned the validity of this instrument. However, as Belbin (1993) points out, this instrument is not intended to be a `stand alone' basis for identification of team roles and makes reference to his Interplace system which uses a computer-based approach to combining multi-source input (using the BTRSPI) and structured observation.

In spite of this specific debate there does appear to be a trend to questioning the overall Belbin Team Role model, based on demonstrated inadequacies of one instrument used to identify team roles. The limitations of the instrument have led to inferences relating to the underlying constructs. However, as

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Dulewicz (1995) demonstrated the use of the original basis for identifying team roles (ie, 16PF) does produce evidence which supports the underlying constructs. In a number of the follow-up studies (Furnham et al 1993, Fisher et al 1994, Berry 1994, Senior 1995) the teams which have been covered in the research have included non-managerial teams. However, Belbin's studies related quite specifically to management teams (Belbin and Life 1976, Belbin 1981) and therefore the validity of findings which relate to samples including non-managerial teams has to be considered.

In spite of issues around the validity of both the Belbin Team Role Self-Perception Inventory (BTRSPI) and the underlying constructs there have been strongly argued rationales for the use of BTRs for purely developmental purposes within the practitioner arena (Parkinson 1995, Fowler 1995, Proctor 1995).

The Henley Research formulae for producing Belbin Team Roles from the 16PF are reported by Dulewicz (1995). These are shown in Appendix II. In deriving team roles from the 16PF the significance of the 16PF factor B (a cognitive/intelligence scale) for the roles of Plant and Monitor Evaluator becomes apparent. Whilst it is common practice to use the 16PF to identify Belbin Team Roles it is important to be aware that the cognitive/intelligence element was originally based on a combination of the 16PF factor B scale and the Watson-Glaser Critical Thinking Appraisal (Belbin 1976, 1981). Beyond specific roles it was found from the original Henley research that effective teams required two roles with high mental abilities (Belbin 1976, 1981, Berry 1995). In the research Belbin found that the most effective teams required one Plant plus one other role with higher than average mental abilities. The significance of mental abilities was reinforced by the Henley results which showed that good "runner-up" teams had an overall `good level of mental ability'. Yet the overall high mental ability teams did not out-perform other teams. In the original research Belbin's findings in relation to the respective performance of high mental ability teams and other teams matched the overall findings of Bahn (1979). Therefore, there may be a need to re-integrate the Watson-Glaser element in the calculation of team roles in future studies to raise the understanding of the impact of `mental ability' (Dulewicz,1995).

2.2 Team Management Index (Margerison and McCann 1985)

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Margerison and McCann developed a team role model which looks at teams from a socio-psychological perspective (Margerison and McCann 1985, Berry 1994).

They identified eight major activities and four key issues which are at the heart of managerial differences and claim these to be derived from the work of Jung (1921). The measures they have devised to examine these activities and issues are:

i) How people prefer to relate to others (Extrovert versus Introvert)

ii) How people prefer to gather information (Practical versus Creative)

iii) How people prefer to make decisions (Analytical versus Emotional)

iv) How people prefer to organise themselves and others (Structured versus Flexible).

Of the measures employed it is important to comment on the Extroversion - Introversion dimension. Jung (1921) regarded extroversion and introversion as "mutually complementary" attitudes whose differences "generate the tension that both the individual and society need for the maintenance of life". Extroverts, within this Jungian model, are oriented primarily toward the outer world. Therefore, they tend to focus their perception and judgement on people and objects. Introverts, within this model, are oriented primarily toward the inner world. Their perception and judgement, consequently, are oriented toward the inner world and focus on concepts and ideas. This conceptual framework differs significantly from that more generally employed in the description of personality (Barrick and Mount 1991, Cattell 1970). Within this trait based model Extroversion is associated with gregariousness, assertiveness, sociability, expressiveness and surgency; whilst Introversion is associated with the reverse of these traits.

In later sections of this paper the fundamentally different meaning ascribed to this Extroversion:Introversion construct may be significant in terms of interpretation of the results.

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Margerison and McCann (1985) conducted a study which bore a number of similarities to Belbin's original study. Again they identified a range of team roles based on personality characteristics. The roles they identified related to:

i) individual preferences for relating to others in groups

ii) how individuals tended to gather and use information

iii) how individuals prefer to make decisions.

The underlying model for the Margerison and McCann team roles is stated to be Jungian (Margerison and McCann 1985) and the roles identified are labelled and described as follows:

i) **Creator-innovator**: independent, experimental, develop challenging ideas and pursue own ideas; provide new ways of thinking.

ii) **Explorer-promoter**: generates ideas and enthuse others, find out what is happening outside of the organisation; bring information and contacts to the team; influential.

iii) **Assessor-developers**: look for ways of making ideas work in practice, `reality-testers'; unlikely to be carried away with ideas.

iv) **Thruster-organisers**: ability to get things done; organise people and systems to ensure deadlines met; set objectives, formulate plans and press hard for results.

v) **Concluder-producers**: pride in producing to a standard; deliver what is expected when it is expected; work to set procedures.

vi) **Controller-inspectors**: enjoy detailed work; ensure everything correct; careful and meticulous; can be critical.

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vii) **Upholder-maintainers**: strong conviction about the way things should be done; supportive of others; defend the team; prefer to consolidate, advise and support.

viii) **Reporter-advisors**: ability to generate and communicate information; analytical and objective; interested in others and supportive.

ix) **Linker**: good listeners; responsive to others; setting objectives for the team; use resources; set an example; co-ordinate team activities.

Margerison and McCann claim that their model is not related to the MBTI and that in their view the MBTI confuses personal preferences and preferences in a work context (Berry 1995). However, the underlying Jungian origins of the model (Margerison and McCann 1985) do imply linkages with the MBTI. The perceived links between the Margerison and McCann model and the MBTI is highlighted by authors focusing on the performance of managerial roles and exhibition of behaviours on the basis of learned preferences (McClure and Werther 1993). Whilst the Team Management Index is extremely popular in commercial applications (Employment Development Bulletin, 1995, Berry 1995) there is limited publicly available data on which it may be assessed. As was pointed out by Berry (1995) the only data presented for examination is in a sixteen page paper presented at a conference which compared and contrasted the Team Management Index Roles with the Belbin Team Roles based on a population of 4000 managers. However, the reliability data (Cronbach Alphas) presented is based on a relatively small sub-sample of 275 managers. Further inspection and analysis of the data has been denied on the grounds of "commercial confidentiality" (Berry 1995).

The similarities between the Margerison and McCann model and the Belbin Team Role Model appear strong on the basis of an analysis of the description of the roles and underlying analysed or implied traits (see table 1). Indeed some authors have used both Belbin Team Roles and the Margerison and McCann model to explore team performance and team development (Cook 1993).

Margerison and McCann's model is seen by some (Berry 1995) as adding evidence to, rather than conflicting with, Belbin's Team Role model, but as being one which links the behaviour exhibited by individuals in a team context with their functional role.

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However, the four bipolar scales used in the Team Management Index only produce eight roles (or nine if the Linker role is included) whereas, even if the scales are split trichotomously (Krugg 1981), there are 81 possible profiles. Even using the implied MBTI profiles would produce sixteen potential profile combinations and the rationale for reducing this to eight or nine roles is neither explicit nor evidenced with research data.

There may, however, be an intuitive level of role modelling which pervades many of the published team role models and produces a range from six to nine core roles. Table 2 summarises a range of team role models encountered in the literature and maps these onto the Belbin Team Role model on the basis of comparison of the description of role personality characteristics provided by the authors.

2.3 Team Balance and Performance

The original Henley research entailed studying the performance of management teams in a management exercise used in the Henley General Management programme (Belbin and Life 1976, Belbin 1981). The research demonstrated that the combination of different roles within a team had an impact on the performance of teams as measured by achievement in the management exercise. Different combinations of team roles were examined and the results consistently demonstrated that a team, in which all eight of the original roles were present, out-performed all other combinations of roles (Belbin et al 1976). This led to the conclusion that the "ideal" team was one comprising eight members each having a distinct team role (Belbin et al 1976). However, in subsequent work published by Belbin (Belbin 1981, 1993) he qualifies this original "balance model" commenting that:

> "Very few people have the characteristics of just one Team Role, and we are all far more likely to score strongly on more than one role. In other words, we each have preferred and secondary Team Roles."

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Table 1 - Analysis of Belbin and Margerison & McCann Team Roles

Belbin Team Role	16PF Factors	Margerison & McCann Team Role/Function	Traits Implied in Margerison & McCann Roles	MBTI Overall Profile Indicated	Core MBTI
Plant: Creative, Imaginative, Unorthodox, Solves difficult problems	Assertive, venturesome, detached, forthright serious, experimentary, tender-minded, intelligent, imaginative, self-sufficient.	Creator-Innovator: Creative, solves new problems.	Challenger, experimenting, independent, sensitive, self-sufficient, venturesome.	INTP	NT
Resource Investigator: Extravert, enthusiastic, communicative. Explores opportunities. Develops contacts	Calm, venturesome, imaginative, radical, trusting.	Explorer-Promoter: Enthusiastic, explore ideas, develop opportunities, gather information, communicative.	Enthusiastic, persuasive, develop contacts, influential, communicative, explore ideas.	ENFJ/ ENFP	NF
Co-ordinator: Mature, confident, trusting. A good chairperson. Clarifies goals, promotes decision-making.	Calm, assertive, trusting, enthusiastic, detailed, practical, conscientious, controlled.	Linker: Co-ordination, optimises, co-operation, encourages exchange of ideas, promotes decisions.	Enthusiastic, practical, trusting, communicative, sensitive, realistic.	ESTJ	ST
Shaper: Dynamic, outgoing, highly strung, challenger, pressises, finds way round obstacles.	Tense, anxious, assertive, venturesome, expedient, tough-minded, suspicious, apprehensive.	Truster-Organised: Establishing goals and , dealing with hard decisions, making things happen, pressurises.	Practical, assertive, driven, tense, anxious, impatient, tough-minded, expedient.	ESTJ	ST
Monitor-Evaluator: Sober, strategic nd discerning. Sees all options. Judges accurately.	Intelligent, serious-minded, shrewd.	Assessor-Developer: Analyse ideas rigorously, assess chances of success. Judges realities.	Practical, analytical, challenging, self-sufficient.	ISTJ	ST
Team Worker: Social, mild, perceptive, accommodating. Listens, builds	Outgoing, trusting, unassertive, group-oriented.	Upholder-Maintainer: Providing support for others. Protect the team, avoid	Group-oriented, outgoing, conservative, supportive, consensus oriented.	ESFJ	SF

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Belbin Team Role	16PF Factors	Margerison & McCann Team Role/Function	Traits Implied in Margerison & McCann Roles	MBTI Overall Profile Indicated	Core MBTI
averts friction		friction, get results.			
Implementer: Disciplined, reliable, conservative and efficient. Turns ideas into practical actions.	Conscientious, tough-minded, practical, trusting, co-operative, controlled.	Concluder-Producer: Deliver results, turn ideas into action. Efficiency focus, conservative	Conscientious, practical, conservative.	ESTJ/ISTJ	ST
Completer-Finisher: Painstaking, conscientious, anxious. Searches out errors and omissions; delivers on time.	Anxious, tense, controlled, conscientious, apprehensive.	Controller-Inspector: Detail to assessed, deliver on-time, quality focus. Looks for errors and omissions.	Conscientious, self-sufficient, independent, tense.	ISTJ	ST

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Table 2 - Team Role Models

Author	Comparison of Role Models								
Belbin, M (1976, 1983)	**Plant**	**Resource Investigator**	**Co-ordinator**	**Shaper**	**Monitor Evaluator**	**Team Worker**	**Implementer**	**Completer**	**Specialist**
Benne & Sheats (1948)	Initiator-Contributor	Gatekeeper-Expediter Information-Giver	Coordinator Encourager Information-seeker	Orienter Energiser Opinion-Giver	Elaborator Standard Setter Opinion-Giver Evaluator-Critic	Compromiser Encourager Follower	Energiser Procedural Technician	Recorder Standard-Setter Procedural Technician Information-Seeker	Procedural Technician Standard Setter
Margerison & McCann (1985)	Creator-Innovator	Explorer-Promoter Reporter-Advisor Advisor	Linker	Thruster-Organiser	Assessor-Developer Reporter-Advisor	Upholder-Maintainer Assessor-Developer	Concluder-Producer	Controller-Inspector Concluder-Producer	Advisor
Ray & Bronstein (1995)		Commentator	Team Leader Training Coordinator Morale and Recognition	Team Leader	Team Statistician	Morale and Recognition Training Coordinator	Scheduler-Timekeeper	Recorder Team Statistician	
Phillips, N (1992)	<u>Creative</u>: putting ideas forward pursuing change <u>Practical</u>: provoking thought	<u>Creative</u>: generating enthusiasm conveying excitement suggesting adjustment to existing proposals	<u>Practical:</u> co-ordinating group activity delegating tasks summarising activity	<u>Practical:</u> driving the group forward keeping to agreed goals	<u>Applied:</u> assessing quality	<u>Practical:</u> co-ordinating group activity <u>Applied:</u> being aware of members' individual needs keeping to group	<u>Applied:</u> ensuring work is done	<u>Applied:</u> ensuring work is done paying attention and responding to detail monitoring progress keeping to agreed goals	

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Author	Comparison of Role Models								
Belbin, M (1976, 1983)	**Plant**	**Resource Investigator**	**Co-ordinator**	**Shaper**	**Monitor Evaluator**	**Team Worker**	**Implementer**	**Completer**	**Specialist**
						structures			
Gibb, JR & Gibb, LM (1955)	Initiating	Informing	Supporting Informing	Initiating	Evaluating	Supporting	Regulatory	Regulatory	
Katzenbach & Smith (1993)	General suggester	External liaison Educator	External liaison Goal suggester Motivator Arbitrator	Motivator Goal Suggester	Challenger	Arbitrator		Challenger	
Spencer & Pruss (1992)	Visionary	Explorer	Peacemaker	Challenger Pragmatist	Challenger Librarian	Peacemaker Coach Confessor	Pragmatist Librarian	Beaver Librarian	
Mumma (1992)	Creator	Innovator	Moderator	Leader	Evaluator	Manager	Organiser	Finisher	
Davis et al (1992)	Driver	Driver Enabler	Enabler Executor	Driver	Controller	Enabler	Planner	Executor Controller	

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However, it has also been pointed out that in the original research (Belbin et al 1976, Belbin 1981) some thirty percent of the manager's tested evidenced no distinct Team Roles. It may be that these managers would fit into the latterly proposed (Belbin 1993) ninth role (ie, that of Specialist). In practice Belbin's original findings have largely been borne out in work on the Henley Senior Management Programme where, on average, some 25% of participants have had no clear BTR and been labelled as Generalists (Dulewicz 1996b). There is, however, no published empirical evidence to support the emergence of Belbin's Specialist role or the possibility that it explains the preferences of those managers whose tests otherwise demonstrate no distinct Team Roles.

The original "balance model" implies a team size of eight (Belbin et al 1976). In reality teams of both more and less than eight are encountered. The emergence of the concept or preferred and secondary roles led Belbin to conclude (Belbin 1981, 1993) that individuals can perform a variety of roles and that a good spread of Roles and balance can be achieved in smaller teams of four to six members. However, research evidence to substantiate this is not presented by Belbin.

The probabilities of encountering an "ideal" eight member team in a practical setting is very remote (Berry 1995). Berry calculates the probability of encountering a "balanced" team by chance as being less than one in two thousand. However, he goes on to point out that the probabilities of encountering an "overbalanced" team (ie, a team in which each member has more than one strong Team Role) is very much higher (around one in 90). These probabilities raise questions relating to the measure of mix or balance and indicate the need for further research into the relationship between Team Roles and performance.

Whilst the Belbin Team Role Model is widely used commercially there is a need for evidence to support its validity in such a setting (Furnham et al 1993, Senior 1995, Dulewicz 1995). Studies which have been designed to provide this evidence are scarce and those that do exist (eg, Fisher et al 1994) use a somewhat simplistic measure of balance, entailing a count of the highest scoring Team Role of each member. This, however, takes no account of the potentially damaging impact (in terms of team working) of duplication of roles. For example, in

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the original Henley research teams with more than one Shaper performed less effectively than `balanced' teams (Belbin et al 1976, Belbin 1981). Indeed, the study reported by Fisher et al (1994) discounted one role completely (that of Company Worker) on the basis that line managers and direct reports were both in the team, thus negating the value of including the role (although no evidence is presented to support this conclusion). From the data provided in the publication of this study it is evident that the inclusion of this role could have produced significantly different results.

Berry (1995) has addressed the issue of measuring team mix and produced a statistically derived index which:

i) compensates for the effect of duplicate roles

ii) allows for the existence of preferred, secondary (and even tertiary) Roles

iii) enables comparisons to be made between teams of different size.

From his research amongst teams drawn from the Henley General Management Course, Fire Officers and groups of students on post-experience university courses, Berry provides some supporting evidence for the original Team Role model. However, he raises the possibilities that further roles might exist and that the balance of team roles and impact of this on performance may be situational. Although raising an interesting point, in his research Berry uses the Belbin Team Role Self-Perception Inventory which is of questionable validity (Furnham et al 1993) and furthermore, does not confine his study to management teams alone.

Although the above review has focused on the Belbin Team Role model, a common theme in other team role models (Margerison and McCann 1985, Katzenbach and Smith 1993, Ray and Bronstein 1995, Davis et al 1992, Spencer and Pruss 1992, Mumma 1992) is that of balance. The linkage between balance of roles and performance of teams is inferred or claimed by many of the authors of these models. However, data to demonstrate the nature of the balance and its relationship to performance is not presented.

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3. Myers-Briggs Type Indicator

3.1 The Instrument

The Myers-Briggs Type Indicator is an instrument which has been designed to make the theory of psychological type, developed by Jung, both understandable and usable (Myers and McCaulley 1989).

Jung (1921) developed three dimensions to explore individual cognitive style. These were: i) how individuals approach life; ii) the way in which individuals become aware of the world; and iii) the way in which individuals reach conclusions about the world. In developing the explicatory framework Jung identifies a number of his underlying assumptions, which are:

i) past experience, and expectations about the future, influence behaviour and personality;

ii) individuals are capable of constant and creative development; and

iii) personality is an open system which is receptive to inputs and exchanges.

He considers behaviour to be a sub-system of personality and one which can change as a result of inputs from, and interactions with, the external environment. Within this belief he highlights the influences of other people as having a significant impact on behaviour.

Jung's theory postulates two attitudinal orientations and four basic psychological functions (Jung 1977). The attitudinal orientations comprise introversion and extraversion which relate to the focus of attention and flow of psychic energy of an individual. The extravert's attention is externally focused, whilst the introvert is inwardly focused. The basic psychological functions relate to perceptual functions which mediate the way in which information is handled by the individual. These functions, which are bipolar, are briefly summarised in figure 1.

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Figure 1 - Jungian Typology

Sensation: mediates information through use of the senses; establishes conscious reality; is existential	Intuition: goes beyond the apparent "world"; explores potential to identify possibilities
Thinking: structures and evaluates perceptions in terms of logical inferences; objective and impersonal	Feeling: processes perceptions by assigning value; subjective and personal

Implied in Jung's typology are two additional orientations relating to the way in which individuals approach the outer world in terms of judgement or perception. These were made explicit by Myers (1962) who labelled them as judging and perceiving and described judging as being related to the evaluation of external stimuli and orientation to cope with these via structure and control. Perceiving is described in terms of an individual who is primarily receptive to stimuli and seeks to understand and adapt to life based on these stimuli.

The Myers-Briggs Type Inventory attempts to operationalise these constructs and to identify, from self-report, the basic preferences of people in regard to perception and judgement, so that the effects of each preference (singly and in combination) can be put to practical use (Myers and McCaulley 1989). In broad terms the descriptions of type used within the MBTI are:

Sensing Perception (S): Observation by senses. Focus on immediate experience. Enjoy "here and now". Realistic. Practicality. Detailed focus.

Intuitive Perception (N): Possibilities, meanings, and relationships perceived through insights. Perception of patterning. Creative discovery. Perception beyond what is visible to senses. Future oriented. Imaginative, abstract thinking and creative.

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Thinking Judgement (T): Links ideas by logical connection. Cause and effect analysis. Analytical ability, objective, critical.

Feeling Judgement (F): Weighing relative values and merits. Understand relative values. More subjective than objective. Link to values of others. Understand people. Need for affiliation. Tender-minded.

Extraversion (E): Desire to act on environment. Rely on environment for stimulation and guidance. Action oriented. Impulsive. Frank and open. Sociable. Communicative.

Introversion (I): Focus on inner world of concepts and ideas. Focus on clarity of concepts and ideas. Consecutive. Thoughtful. Self-sufficient.

Perceptive Attitude (P): Attuned to information. Focus on realities and/or possibilities. Curious, open, interested, spontaneous, adaptable. Open to new experience.

Judging Attitude (J): Decision focus. Seeking closure. Linked to logical analysis. Closure when enough information. Decisive, organised.

The MBTI, and the way in which it is constructed and used, is seen to differ from many other personality instruments (Myers and McCaulley 1989) in that:

i) It is designed to implement a theory; therefore the theory must be understood in order to understand the MBTI.

ii) The theory postulates dichotomies; therefore some of the psychometric properties are unusual.

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McCrae and Costa (1988) extend this commentary on the unusual nature of the MBTI pointing out that:

i) It is based on classic Jungian theory.

ii) It measures types rather than traits or continuous variables.

iii) It is used to explain the behaviour of a wide range of individuals; not just professionals or managers.

Furthermore, McCrae and Costa point out that, in terms of a psychometric instrument, the MBTI has a number of limitations, from a research perspective, which are:

i) It is built around bimodal distribution of preference scores.

ii) Studies, using the MBTI, do not always confirm the validity of the underlying theory or operationalisation of the associated constructs.

From the perspective of empirical study the potential issues are further compounded by the nature of the instrument, which is ipsative, and therefore can limit the nature of the methods of study which may be used to determine its validity and compare it with other instruments (Baron 1996, Bartram 1996).

3.2 Reliability of the Myers-Briggs Type Indicator

In presenting reliability data in the MBTI manual Myers and McCaulley (1989) have examined internal consistencies based on Alpha coefficients, none of which are below 0.7 for the four scales. They have also examined split-half reliabilities for Type Categories. Items were selected for X and Y halves by a logical split-half procedure. Each index was split into halves, taking all item statistics into consideration and pairing items that most resembled each other and correlated most highly. However, they do point out that these are derived from product-

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moment correlations of continuous scores from the X half and Y half of each index and take no account of the dichotomies for which the MBTI was designed. To correct for this they investigate the score reliabilities by use of a 2x2 table examining how often the X half and Y half of a given index agree or differ as to type category.

Again in examining test-retest reliabilities Myers and McCaulley point out that the nature of the MBTI goes beyond the typical computations of correlations for the four continuous scores (ie Extroversion:Introversion; Intuition:Sensing; Thinking:Feeling; Perception: Judging). The practical issues relate to the likelihood that, on retest, a person will emerge with the same MBTI type (ie, the likelihood that a person will choose the same pole of all four dichotomous preferences). In the test-retest studies the TF scale produced the lowest reliability coefficients.

Examination of the Test-Retest Reliabilities of Type categories showed probabilities significantly greater than the chance probability of choice of all four categories leading to the same Type (6.25%). They conclude that test-retest reliabilities of the MBTI show consistency over time.

Within the literature there appears little further investigation of the reliability of the instrument.

3.3 Validity of the Myers-Briggs Type Inventory

The validity data in the MBTI manual (Myers and McCaulley 1989) is prefaced by the comment that:

> "Because the MBTI was designed to implement Jung's theory of psychological types, its validity is determined by its ability to demonstrate relationships and outcomes predicted by theory".

Given this perspective most of the validation data presented focuses on the construct validity of the instrument. A large number of correlations with other personality and interest instruments are presented which, in general terms show a large number of significant results. However,

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these correlations do have a limitation in terms of evidence for construct validity as they are based on the four scales (EI, SN, TF, and JP) and thus only report four preferences at a time and not the relationship of the sixteen Types (ie, ESTJ, ESFJ, ... etc). In examining the data the differences in underlying interpretation of meaning of the Introversion: Extraversion scale are highlighted. Myers and McCaulley (1989) point out that extraversion, within the MBTI framework, is an outward attitude in which energy flows to the environment and may be manifested in different ways. Conversely MBTI Introversion refers to an inward-turning attitude more concerned with inner than outer realities. Although correlations with this dimension are found with other instruments the underlying positive or negative values ascribed to the dimension in other instruments are different to those imputed within the MBTI.

From the range of instruments examined, Myers and McCaulley consider that the correlations between MBTI and the Jungian Type Survey and Gray - Wheelwright (Wheelwright, Wheelwright and Buehler 1964) are of special interest in terms of construct validity. The correlations between the MBTI and JTS were: E:0.68 ($p<0.01$), I:0.66 ($p<0.01$) S:0.54 ($p<0.01$), N:0.47 ($p<0.01$), T:0.33 ($p<0.01$) and F:0.23 ($p<0.05$). It would appear, therefore, that the MBTI and JTS are tapping similar constructs. This tends to underpin the view that, although the Margerison and McCann (1985) Team Management Index model is stated to be based around the JTS there should be a relationship between the Team Roles identified through this model and the MBTI.

In moving beyond the data on validity reported in the MBTI manual, McCrae and Costa (1988) comment that other studies do not always confirm the validity of the MBTI theory or measures. In broad terms there is a view that there is more need for research into the validity of the MBTI (Maxon 1986, McClure and Werther 1993, Furnham and Stringfield 1993), and specifically in its relationship to occupational rather than experimental data (Furnham and Stringfield 1993) and to teamworking and managerial teams (Cook 1993, McClure and Werther 1993; Hinber 1983, Churchman 1971).

Much of the occupational research, to date, has tended to focus on the four basic Jungian functions which are expressed in the MBTI (ie, sensation, intuition, thinking and feeling)

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[Berthon, Money and Pitt, 1994]. However, although Berthon et al (1994) claim that the attitude dichotomy of extraversion-introversion, and the functional dichotomy of judgement-perception are somewhat overlooked, there are a number of studies which do incorporate the attitude dichotomy and find this as being the strongest area of correlation between MBTI and other measure of personality, competency or behaviour (Pinder and Herriot, 1990).

There are claims made that the MBTI is more effective than other instruments in measuring differences between individuals (Huber 1983). However, for example, the data provided by Huber shows lower level validities for MBTI than either the 16PF or OPQ instruments. Indeed, the evidence presented by McCrae and Costa (1988) and Furnham and Stringfield (1993) suggests that, whilst there is some evidence of the validity of the MBTI, it remains only a moderate predictor of behaviour.

A number of the studies of the MBTI focus more on its value as a self-insight or developmental tool than as a valid psychometric instrument. For example, Maxon (1986) highlights the value of the instrument in developing self-insight and stimulating team processes and development based on conclusions from his case study examining "Innovation teams" within Hewlett Packard. Similarly, Cook (1993) highlights the value of the MBTI in exploring team development needs.

Examples of the range of research findings relating to the MBTI and its validity in predicting performance are summarised in table 3.

Overall it would appear that there is scope for further, organisationally-based, research into the validity of the MBTI. However, the evidence to date would appear to indicate a degree of validity for, at least, a number of the MBTI scales. Furthermore, there is evidence of construct validity for the MBTI when compared with a number of instruments, including the 16PF (Myers and McCaulley 1989).

4. Research Question

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In the introduction to this paper the dominance of the Belbin Team Role and Margerison and McCann Team Management Index as models to examine managerial team roles and performance was highlighted.

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Table 3 - Relationships Between MBTI and Individual/Team Performance

Study/Author	Number in Study	MBTI Scales Exami-ned	Criteria	Conclusions	Comments	Setting
Nutt (1990)	168	SN, TF	Decision style	Differences between senior executives and middle managers ST = systematic; NT = speculative ; NF = heuristic; SF = judicial; Link MBTI and Decision Style SF = action-oriented; ST = action-averse NT&NF nearly identical and neutral	Decision style highly significant factor in action taking	Experimental simulations
Nutt (1986)	137	SN, TF	Decision style and Strategic Decisions	SF = action oriented; ST = action averse; NF = charismatic; ST = analytic; SF = consultative; NT = speculative	Impact of organisatio-nal culture significant	Simulative, experimental
Furnham & Stringfield (1993)	370	EI, NS, TF, PJ	Actual work behaviours and managerial practices (using 360° feedback)	MBTI only moderate predictors of behaviour E, T & J good positive correlations with good managerial practice I & F negative correlations with good managerial practice	Cross-cultural study	Real organisation
Churchman (1971)	150	NS, TF	Decision styles	ST:NF and SF:NT are opposite frameworks/ approaches	Suggesting an “ideal” approach	Simulation
Maxon (1986)	8 teams	All 16 MBTI types	Climate Team Performance	INTP/INTP tend to be innovators STJ’s good time managers NTJ’s innovators and risk-takers NTJ motivated by challenge and reward STJ motivated by recognition and status	Few solid conclusions or much objective data	Organisation (Case Study) Large amount of observation rather than measurement
Bushe & Gibbs (1990)	64 trainee OD Consultants	EI, NS, TF, PJ	OD competencies using McBer Framework (Rated by experts)	Only N showed correlation with Trainer rating of OD competence	Some follow-up Work reinforced conclusions	Organisation-based (but on training programme)

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Study/Author	Number in Study	MBTI Scales Exami-ned	Criteria	Conclusions	Comments	Setting
Huber (1983)	8 teams	NS, TF	Individual differences between team members	N= big picture S = detail focus	Managerial/Executive levelNeed for more research Data on MBTI less significant than from 16PF/OPQ	Organisational Study
Pinder & Herriot (1990)	274	EI, NS, TF, PJ	Assessment Centre Ratings	MBTI strongest correlations on IE MBTI correlations not as strong as OPQ	Compared MBTI with OPQ	Assessment Centre
Berthon, Money & Pitt (1994)	169	NS, TF, PJ	Self-Report Decision-Making Context	Perception-type (NJ, NP, SJ, & SP) more significant impact on managers perceptions than other factors Perception type explains more variance than traditional decision-making style	Brings PJ dimension into study	Research study using questionnaires

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The Belbin Team Role model is, as has been explained, derived from research using the 16PF personality inventory (combined with structured observation using a Bales framework and the Watson-Glaser Critical Thinking Appraisal). The roots of the Margerison and McCann Team Performance Index are less open to examination, but through specific statements (and underlying inference) appear to be built from Belbin's research (Margerison and McCann 1985, Berry 1995). Margerison and McCann do not claim direct usage of the MBTI in computing their Team Management Index. However, they do refer to the Jungian Type Inventory (Margerison and McCann 1985, Berry 1995). This inventory appears, on the surface, to be replicated by the MBTI and, indeed, the validity data within the MBTI manual (Myers and McCaulley 1989) shows strong and direct correlations between the two instruments. Both team role models (ie, Belbin and the Team Management Index) highlight the importance of role mix for successful performance, as do many other team role models (Davis et al 1992, Mumma 1992, Katzenbach and Smith 1993, Spencer and Pruss 1992, Ray and Bronstein 1995). Furthermore, a number of authors point to the value of using MBTI as an instrument to aid team development (Churchman 1971, Davis 1992, Cook 1993, Huber 1983, Maxon 1986).

From the foregoing it would appear that there is, at least, an implied relationship between the profiles of individual style preferences derived from the MBTI and the team roles that individuals fulfil as described within the framework of the Belbin Team Role model. Therefore, the core research question to be addressed within this paper is:

> "It is there a significant relationship between an individual's MBTI profile and their predominant Belbin Team Role?"

The relationships between the MBTI and 16PF factors have been established by Myers and McCaulley (1989) and are summarised in table 4. Within this table (derived from data provided by Cattell, Eber and Tutsuoka, 1970) the potential MBTI profile, or components of such a profile are estimated in the extreme right hand column.

Table 5 outlines the respective directions of the 16PF factors involved in the computation of the Belbin Team Roles using the original Henley formulae (Dulewicz 1995) and on the extreme

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right shows the hypothesised MBTI profile components. (A more detailed analysis of this table is shown in Appendix II).

From the foregoing it is possible to develop the following hypotheses:

H_1 There is a relationship between an individual's score on MBTI scales and Belbin Team Role.

H_2 There is a relationship between the sensation-intuition and thinking-feeling scales in an individual's MBTI profile and their Belbin Team Role.

In section 2.1 above the potential limitations of factor B from the 16PF in calculating team roles was examined. The value of this factor as an intelligence measure has also been challenged (Morgan and Morgan 1990). In Belbin's original work the CTA was also employed in defining team roles and the overall approach to role identification has already been discussed (Belbin et al 1976, Belbin 1981) were discussed. From these discussions, the following hypotheses may be added to H_1 and H_2:

H_3 The relationships between an individual's score on MBTI scales and Belbin Team Role will be more significant if factor B from the 16PF is replaced by the individual's sten score from the Watson Glaser Critical Thinking Appraisal.

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Table 4 - MBTI V'S16PF Significant Correlations

MBTI

16PF Factor	E1	SN	TF	JP	Inferred MBTI Relationship
A	-.22 to -.43	-	.19 to .31	-.18	EFJ
B	-	.10 to .35	-	-	N
C	-.23 to -.32	-.11 to -.16	-.18	0.9	ESFP
E	-.21 to -.32	.23 to .29	.18	-.20 to .32	ENF
F	-.3 to -.59	.12 to .33	.16 to .28	.14 to .34	ENFP
G	-.11 to -.22	-.32 to -.44	-.11 to -.24	-.48 to -.57	ESTJ
H	-.53 to -.76	.13	-	-	EN
I	.20	.25 to .33	.25 to .37	.19 to .33	INFP
L	.09 to .19	-	-.19	.09 to .24	ITP
M	.25 to .26	.30 to 36	.17 to .19	.15 to 40	INFP
N	.14	-.10 to -.31	-.19 to -.29	-.13 to .24	ISTJ
O	.20 to .33	-.11	-.12 to .22	-.10	ISJ
Q1	-	.25 to.32	-.15 to -.40	.15 to .21	NTP
Q2	.41 to .52	.11 to .22	-.11	.12 to .21	INTP
Q3	-.10	-.15 to -.43	-.17 to -.24	-.27 to -.41	ESTJ
Q4	.22 to .32	.26	.09 to .30	-	INF

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16PF Factor	E1	SN	TF	JP	Inferred MBTI Relationship
2nd Order Traits					
Exvia	-.51 to -.74	.12 to .13	.12	.10	ENFP
Anxiety	.34 to .35	-	.14 to .15	-	IF
Tough-Poise	-.17 to -.30	-.21	-.28 to -.34	-	EST
Independence	-.10 to .29	.33 to .46	-.10 to -.23	.32 to .35	INTP
Criterion Predictions					
Neuroticism	.37 to .48	-	.15 to .18	-	IF
Leadership	-.44 to -.58	-.15 to -.35	.13 to -.26	-.15 to -.37	ESTJ
Creativity	.16 to .43	.37 to .50	-.09	.25 to .39	INTP

+ve correlations associated with MBTI; I, N, F & P

-ve correlations associated with MBTI, E, S, T, J

(From Cattell, Eber and Tatsuoka 1970: A series of studies with n ranging from 66 to 645)

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Table 5

Team Role Formulae & 16PF Factors

Links with Belbin from 16PF ®											**MBTI Profile Indicators**
Pl.	↓A	↑B	↑E	↓F	↓H	↑I	↑M	↓N	↑Q1	↑Q2	INTP
Sh	↑E	↑H	↑L	↑O	↑Q4	↓C	↓G	↓I			ENTP
Co.	↑Q3	↑G	↑F	↑E	↑C	↓M	↓L	↓A			ESTJ
RI	↑C	↑H	↑M	↑Q	↓L						ENTJ/P
TW	↑A	↓E	↓L	↓Q 2							ESFJ
IMP	↓I	↓M	↓Q 1	↓L	↑G	↑Q 3					ESTJ
CF	↑G	↑O	↑Q 3	↑Q 3	↓C						ISTJ
ME	↑B	↑N	↓F	↑F							ISTJ

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Based on Belbin Formulae delivered from original Henley Research (Dulewicz 1995)

H_4 The relationships between the sensation-intuition and thinking-feeling scales in an individual's MBTI profile and their Belbin Team Role will be more significant if factor B from the 16PF is replaced by the individual's sten score from the Watson Glaser Critical Thinking Appraisal.

The overall structure of potential MBTI profiles and core sensation-intuition and thinking-feeling relationships derived from both the MBTI: 16PF correlations (Cattell, Eber and Tutsuoka 1970) and a content analysis of profile descriptions are shown in table 6.

5. Methodology

In order to test the above hypotheses data from 111 managers in a life assurance company who had undergone a structured development centre were analysed.

The mean age of the managers in the sample was 37.01 years (SD=5.12) and of the total sample 77.5% of the managers were male and 22.5% female.

The organisational level of managers was measured in terms of reporting levels below the company's Chief Executive Officer. This convention has been employed in a number of studies of managerial teams and managerial behaviours and competencies (Dulewicz and Herbert 1996, Saruwono 1995). The mean organisational level of participants was 1.83 (SD = 0.63) [with 1 level below the Chief Executive being represented by 1.0]

All participants had completed the following instruments as part of the development centre:

16PF (form A)

MBTI (form G)

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Watson-Glaser Critical Thinking Appraisal.

The Belbin Team Roles for participants were calculated from the 16PF using the original Henley formulae (Dulewicz 1995). In calculating 16PF sten scores the British Population norms were used (Saville 1972). Watson-Glaser scores were normed against table 37 (British Managers).

It is controversial, due to the nature of the MBTI instrument, to correlate MBTI profiles with Belbin Team Role stens. The MBTI profile data may only conventionally be expressed in a nominal format this is due to the ipsative nature of the instrument (Bartram 1996, Closs 1996). However, in practice, in a number of studies the MBTI scales have been used for correlational analysis (Myers and McCaulley 1989.)

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Table 6

Development of Hypotheses

Belbin Team Roles	Belbin/MBTI Hypotheses			
	(a) From 16PF Correlations		(b) From Overall Analysis	
	(I) Overall	(ii) Core	(i) Overall	(ii) Core
Plant	INTP	NT	INTP	NT
Resource Investigator	ENFJ / P	NF/NP	ENFJ/P	NF
Co-ordinator	ESTJ	ST/NT/NF	ESTJ	ST
Shaper	INTP	NF/NT	ESTJ	ST
Monitor Evaluator	ISTJ	ST	ISTJ	ST
Team Worker	ESTJ	SF	ESFJ	SF
Implementer	ESTJ	ST	E/I STJ	ST
Completer Finisher	ESTJ	ST/NF	ISTJ	ST

In order to avoid this controversy it would be valuable to use both the MBTI and BTR data in a nominal format using a Chi Square test. However, to use Chi Square it is necessary to ensure that each theoretical cell contains at least five observations (Norusis 1994). given the potential 16 MBTI profiles, eight BTR's and dichotomous potential there are some 512 possible combinations or cells. At a requirement of a theoretical five observations per cell this would require a sample of 2560. The inappropriateness of applying a Chi-square on a sample of 111 in these circumstances is clearly evident. Even if the five theoretical observations per cell were relaxed somewhat, as has been suggested (Wright and Fowler 1985 everitt 1977) the required sample for Chi square analysis would still exceed that available.

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An alternative approach through examining a comparison of MBTI profiles at the nominal level with BTR's as a continuous variable by means of point-biserial correlation is also excluded due to available sample size.

In examining Belbin Team roles for each participant those roles with a sten score of eight or more were considered. Whilst this is the common basis of ascribing team roles (Dulewicz 1995) there is some debate around the rationale for selecting a sten eight score for inclusion as a role preference. There is little direct evidence from Belbin's original research as to the appropriate sten to select for attribution of a role preference (Belbin et al 1976, Berry 1995). However, in reviewing interpretation of the 16PF Krug (1981) has established a sten eight cut off as a key selection factor. In looking at BTRs, a view has been expressed that if looking at preferred and secondary roles a sten cut-off seven may be more appropriate (Senior 1995, Berry 1995).

For the purposes of this study results have been examined using both sten eight and sten seven cut offs for inclusion of Belbin roles in the analysis. Results for both decisions have been presented. However, in all cases the role of Monitor-Evaluator has only been included in the profiles if the individual displaying sten eight (or seven) on this role also displays sten eight (or above) on factor B of the 16PF. This is in line with the original Henley equations (Dulewicz 1995).

In order to address potential limitations of the 16PF factor B scale (Morgan and Morgan 1990) and to attempt to reflect the use of the Watson-Glaser Critical Reasoning Appraisal in Belbin's original work (Belbin et al 1976, Belbin 1991, Berry 1995) a second analysis of the data has been conducted using Watson-Glaser sten scores in place of the 16PF factor B sten scores in identifying Belbin Team Roles. This substitution (from examination of the original Henley equations) would be likely to impact on the occurrence of Plant and Monitor-Evaluator roles. For the purposes of consistency the Monitor-Evaluator role in the second analysis would only be counted if the Watson-Glaser sten score is eight or above.
The use of Watson-Glaser scores which are normed against a managerial population when the 16PF scores are normed against a general population carries the risk of reducing the proportion of participants in the higher sten scores for the same initial raw score. Bartram (1992) conducted a study of the 16PF amongst more than 1700 managers applying for

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managerial jobs through a recruitment agency. In this study he found that managerial population 16PF norms were significantly different to general population norms and were, in particular, higher for factor B. The mean factor B sten score for the general population (using norms provided by Saville 1972) was 7.01 (SD 2.13) compared with an overall management sample mean of 9.43 (SD 1.88) [Bartram 1996].

Ideally in examining team roles applicable to managerial teams, specific 16PF managerial norms should be used. However, although Bartram's paper reports differences the specifically derived 16PF norms based on this data have not been calculated and used in this study. However, Bartram's findings point to the likely greater validity of Belbin Team Roles using a Watson-Glaser score normed on a managerial population than a 16PF factor B score derived from general population norms. The data on these two scales is correlated in order to explore this assumption.

The increasing evidence pointing to a relatively small number of factors describing individual differences; known as the "Big Five" personality factors (Barrick and Mount 1991, Digman 1990, Norman 1963) could indicate that both the Belbin Team Role Model and the MBTI are seeking to identify too many factors. The 16PF instrument has a number of second-order factors which are linked to the "Big 5" (eg, Extroversion, Agreeableness, Openness, Creativity, Neuroticism). It was, therefore, decided to examine the relationships of both the MBTI profiles and the Belbin Team Roles to these second order factors.

Having examined the overall sixteen MBTI profiles against the Belbin Team Roles and 16PF second order factors the four function roles (ie, NT, NF, ST, SF) are examined using the same methodology.

6. Results

6.1 Belbin Team Role Distributions

In developing the original Team Roles, Belbin and his colleagues, used the Watson-Glaser Critical Thinking Appraisal in addition to the 16PF. This would, in particular, impact on the "intellectual" roles (Plant and Monitor Evaluator - Dulewicz 1995), in commenting on his study of the relationships between the 16PF, the OPQ and Belbin Team roles, Dulewicz highlighted

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the need for further research, potentially reintroducing the CTA into the Team Role calculation. However, he did point out that the creative focus of the Plant role may require the use of a measure which more clearly examines creative thinking than either the 16PF Factor B or CTA achieve. In order to explore the BTR and MBTI profile relationship fully it was decided to calculate the BTR's using the CTA sten score in place of 16PF Factor B in the BTR equations in addition to the `regular' 16PF based calculations. This is a tentative approach to re-introducing the CTA, as there appears to be no published evidence indicting how Belbin and his colleagues originally incorporated the CTA into their role computation.

The BTRs using the CTA modification, have also been calculated using both an eight and seven sten cut off for identification of roles for each individual.

Table 7 summarises the overall distribution of the BTRs in the sample using the above four bases of calculation of Team Role.

From table 7 it can be seen that the Co-ordinator role (CO) is fairly heavily represented as is that of Resource Investigator (RI). These were found to be only moderately supported by the 16PF analysis (Dulewicz 1995) and in looking at the OPQ he found limited support for the CO role and that there was poor inter-role discrimination between the CO and RI roles. Surprisingly the Monitor Evaluator role (ME) is quite highly represented in this sample. Previous studies (Furnham et al 1993, Dulewicz 1995) have provided little support for this role and identified a need for further research to clarify the role.

Whilst it is difficult to draw any significant conclusions from simply reviewing the distribution of BTR's, it is noticeable that:

i) the use of a sten seven cut off does produce a larger number of roles and cases for analysis and may, therefore, be the more appropriate for the examination of associations with the MBTI profiles.

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Table 7 - Distribution of Belbin Team Roles (n=111)

Distribution	Belbin Team Role							
	CF	CO	IM	ME	PL	RI	SH	TW
a) Frequencies								
i)	18	28	2	**36**	**2**	43	7	20
ii)	18	53	15	**42**	**7**	59	23	36
iii)	18	28	2	**26**	**2**	43	8	20
iv)	18	53	15	**33**	**5**	59	23	36
b) Percentages								
i)	16.2	25.2	1.8	**32.4**	**1.8**	38.7	6.3	18.0
ii)	16.2	47.7	13.5	**37.8**	**3.8**	53.2	20.7	32.4
iii)	16.2	25.2	1.8	**23.4**	**1.8**	38.7	7.2	18.0
iv)	16.2	47.7	13.5	**18.1**	**2.7**	53.2	20.7	32.4

NOTES i) Belbin Team Roles from 16PF: Counting Sten 8 plus as a role for an individual
i) Belbin Team Roles from 16PF: Counting Sten 7 plus as a role for an individual
iii) Belbin Team Roles from 16PF, replacing factor B with Watson Glaser Stens: Counting sten 8 plus as a role for an individualiv)Belbin Team Roles from 16PF, replacing factor B with Watson Glaser Stens: Counting Sten 7 plus as a role for an individual

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ii) **the substitution of the CTA for 16PF factor B in the Team Role equations suppresses the number of ME and PL roles.** This may indicate that the CTA is a more rigorous measure of intellectual components than factor B, thus producing fewer "intellectual" roles. However, it is important to bear in mind that the CTA is normed against managerial populations, whereas the 16PF is normed against a general population sample. Therefore, before any clear conclusions may be drawn further research using 16PF managerial norms (as indicated by Bartram (1992) should be conducted)

6.2 MBTI Profile Distribution

Table 8 shows the distribution of the 16 MBTI profiles amongst the sample population. Table 9 shows the distribution of the four MBTI function profiles (ST, SF, NT and NF).

From table 8 it is evident that the study cannot produce any data in relation to the MBTI profiles covering ESFP, ISFP or INFJ. The possibility of valid data in relation to the profiles with low representation (ie: ENFJ, ENFP, ESFJ, INFP and ISFJ) is questionable. Interestingly, table 9 shows that the majority of the sample are within two of the four function profiles (NT and ST).

In examining the published data available on the MBTI it is evident that the population is not distributed evenly amongst the profile categories (Myers and McCaulley 1989). Whilst there are variations in the published studies an examination of the ranges shown in the last column of table 10 does indicate some notable differences in the population representation in each of the sixteen profiles. In general it appears that it is uncommon for the following profiles to be under-represented: ISFP, ISFJ, ESFP, INFJ, INFP, ESFJ and ENFJ. Indeed in a number of studies they are not represented at all.

Examining the range data indicates that (superficially at least) it is not too unusual that in this sample ESFP, ISFP and INFJ are not represented, and that ENFJ, ESFJ, INFP and ISFJ are under-represented (Myers and McCaulley 1989).

A question arises, in relation to the MBTI, as to whether occupational groupings reflect differing balances of profiles. Quenk (1975) suggests that individuals will tend to find a career niche where they encounter an occupational structure aligned to their MBTI preferences. A number

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of studies have demonstrated that there are significant relationships between work settings and MBTI profile preference scores (Quenk 1975, Quenk and Albert 1975, McCaulley 1977, Myers and McCaulley 1989). Within the MBTI manual (Myers and McCaulley 1989) there are data on the MBTI profile preferences and function profiles for a large range of occupational groupings.

Table 10 provides an extract of the four groupings which would appear to be most relevant to the sample in this study (Professional and Technical staff, insurance staff, managers and administrators and financial managers). In general the current study sample is broadly similar, in distribution terms, to these four groupings in relation to the: ISTJ, ISTP, ESTP, ESTJ, INTJ and ENTJ profiles. It has lower representation of the ISFJ, ISFP, ESFP, ESFJ, INFJ, INFP and ENFJ profiles and higher representation in relation to: INTJ, INTP and ENTP profiles.

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Table 8 - Distribution of MBTI Profiles (n=111)

MBTI Profile	Distribution	
	Frequency	Percentage
ENFJ	2	1.8
ENFP	3	2.7
ENTJ	11	9.9
RNTP	13	11.7
ESFJ	1	0.9
ESFP	0	0
ESTJ	28	25.2
ESTP	5	4.5
INFJ	0	0
INFP	2	1.8
INTJ	9	8.1
INTP	11	9.9
ISFJ	2	1.8
ISFP	0	0
ISTJ	19	17.1
ISTP	5	4.5

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Table 9 - Distribution of MBTI Function Profiles (n=111)

MBTI Profile	Distribution	
	Frequency	Percentage
NF	7	6.3
NT	43	38.7
SF	4	3.6
ST	57	51.4

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Table 10 - Distribution of MBTI Profiles Based on Occupational Groupings

	Professional Technical (82)	Insurance (101)	Managers/ Administrators (7463)	Financial Managers (756)	Current Study (III)	Range in Studies
ST	29.27	36.67	39.40	50.53	51.4	
SF	30.39	20.79	18.93	14.55	3.6	
NF	14.63	25.74	17.54	10.45	6.3	
NT	25.61	16.83	24.5	24.47	38.7	
ISTJ	12.20	6.93	15.88	16.93	17.1	5.76-28.67
ISTP	1.22	3.96	2.69	3.84	4.5	0.85-6.67
ESTP	2.44	3.96	2.71	4.23	4.5	2.53-8.47
ESTJ	13.41	21.78	17.04	25.53	25.2	9.35-46.52
ISFJ	9.76	2.97	6.28	3.84	1.8	1.85-6.48
ISFP	4.88	1.98	2.53	2.12	0	0.35-2.80
ESFP	4.88	6.93	2.80	1.98	0	0-5.93
ESFJ	10.98	8.91	7.32	6.61	0.9	0-6.61

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INFJ	4.88	3.96	3.11	1.06	0	0-2.69
INFP	6.10	3.96	4.56	2.78	1.8	0-4.32
ENFP	2.44	13.86	6.93	3.70	2.7	0.32-15.83
ENFJ	1.22	3.96	4.92	2.91	1.8	0-5.76
INTJ	1.22	3.96	5.64	4.89	8.1	2.67-16.10
INTP	4.88	2.97	3.58	3.31	9.9	0.67-8.63
ENTP	6.10	5.94	4.89	6.61	11.7	1.58-8.63
ENTJ	13.41	3.96	10.06	9.66	9.9	5.33-17.27

Source Myers and McCaulley (1989):Note: numbers in brackets indicate sample sizes

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The similarities and differences are highlighted in examining the function profiles. Whilst being similar to the four groups on the ST profile, the current sample is lower on the SF and NF profiles and higher on the NT profile. Overall this would appear to indicate that the study sample have consistently favoured the T end of the Thinking: Feeling scale in the MBTI questionnaire. If this were true it would indicate that the sample would tend more towards impersonal, logical and rational thinking and less on decision-making entailing an understanding and accounting for individual and group values. This may indicate a higher than expected incidence of the ME role in the Belbin Team Role analysis.

6.3 Correlations between BTR's and MBTI Scale Scores

Given the nature of the computation of MBTI profiles it is not possible to directly correlate them with the BTRs. However, it is possible to correlate the MBTI scale scores with the BTR sten scores. The MBTI instrument is an ipsative one and the BTR's (as calculated from 16PF) are normative and there is considerable debate around the validity of employing parametric tests with ipsative data (Bartram 1996, Closs 1996). However, there is some evidence emerging to the effect that, if the potential limitations are recognised and corrected for the use of parametric tests may be acceptable (Baron 1996, Closs 1996). In examining interscale differences, the use of procedures, such as factor analysis, remain questionable with ipsative instruments (Bartram 1996, Closs 1996). However, in this study interscale differences are not being examined.

Table 11 shows the correlations between the MBTI scale scores and the BTR sten scores. The last two columns include the PL and ME roles calculated using the CTA as an alternative to 16PF Factor B.

From examination of Table 11 it is evident that a number of significant correlations have been found, although in respect of some of these the degree of correlation is not great. No significant correlations are found in relation to the CO and SH roles which would indicate a low likelihood of finding MBTI profiles which are associated with these roles. The relationships between MBTI scales and BTRs which are indicated by the correlational analysis are:

i) both BTRs of PL and ME are associated with the MBTI Introversion scale score;

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ii) the BTR IM role is related to the MBTI Introversion and Judging scale scores;

iii) BTRs of TW and RI are both associated with the MBTI Extroversion scale scores, although TW combines this with a Feeling scale and core whilst for RI Extroversion is associated with Intuitor scale scores;

iv) the BTR of CF is related to MBTI scales of Introversion, Sensing and Judging. This BTR comes closest to being related to a complete MBTI profile.

Once again it appears that substituting the CTA for 16PF Factor B in the BTR computations has an effect on the incidence of the roles of ME and PL. In table 11 it can be seen that the CTA-based version of both PL and ME has stronger correlations with the MBTI scales (albeit limited to the I:E scale). Both the PL and ME correlations are both greater and more significant (moving from $p<0.01$ to $p<0.001$ in all cases).

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Table 11 - Correlations of MBTI Factors and Belbin Team Roles (n=111)

MBTI Factor	Belbin Team Role									
	CF	CO	I	ME	PL	RI	SH	TW	ME 2 (1)	PL 2 (1)
E	-.2642*			-.4407**	-.3455**	.2933***		.3766***	-.4939***	-.3828***
F								.2043*		
I	.2331*			.3999**	.3514**	-.3089***		-.3664***	.4820***	.3552***
J	.4332***		.2465**							
N	-.3006***		-3253.***			.2216*				
S	.3382***		.3168**			-.2523**				
T										
P	-.4107***		-.1944*							

*p<0.05; **p<0.01; ***p<0.001

Notes

(1) ME2 and PL2 have been calculated using Watson Glaser CTA Sten Scores in place of 16PF Factor B in the Belbin Team Role equations

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6.4 Correlations Between MBTI Factors and 16PF Second Order Factors

The 16PF second order factors appear to be aligned with those generally being seen as belonging to the "Big Five" personality factors (Barrick and Mount 1991) which are increasingly being seen as the core factors explaining individual differences. Bartram (1996) suggests that the 16PF second order factors I to IV relate to the "Big Five". In addition this derived second order criterion factor of Creativity may well be seen as a sub-component of the "Big Five" factor of Openess to Experience. It is this 16PF derived factor which is suggested as being the equivalent of the BTR role of PL. Inspection of the Henley formulae and the original description of the BTR research (Belbin and Life 1976, Belbin 1981) also suggest that the PL role equates with the 16PF second order Creativity factor.

Analysis of the data from the current study in relation to the 16PF second order criterion factor of Creativity is shown in tables 12 and 13. From table 12 it would appear that there is a relationship between the 16PF second order factor of Creativity and the MBTI scales which indicate I and N. Table 13 indicates that Creativity is associated with the MBTI S:N scale in the N direction. Furthermore, the results summarised in this table indicate (as shown in previous analyses in this section) that if the 16PF Factor B is replaced with the Watson Glaser CTA sten score then the degree of association is reduced. This is borne out by the evidence that there is a relationship between the MBTI factor N with the PL role calculated using 16PF Factor B, but not with the PL role if calculated using the CTA sten score.

In examining this relationship it is evident that whilst the CTA sten score is related to the 16PF second order factor of Creativity the relationship is not as strong as that found between Creativity and 16PF Factor B (however, this is not too surprising given the basis of calculation of the Creativity second order factor).

In reviewing table 13 it is notable that there is a relationship between the "intellectual" BTRs of ME and PL when using the CTA, whereas this relationship is not indicated when using the 16PF Factor B to calculate the BTRs.

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In exploring these differences it is interesting to note that whilst both the CTA and 16PF factor B are both related to the 16PF second order factor of Creativity the strength of relationship is lower with the CTA. This again could indicate that the CTA is a more stringent measure of "intellectual capability" than 16PF Factor B. However, the differences in norm base for the two measures needs to be examined and researched before such a firm conclusion may be drawn.

The relationships between the PL and ME roles indicated with calculations based on both CTA and 16PF Factor B is both strong and in the same direction. This premise is further supported by the positive correlation (significant, albeit small) between 16PF Factor B and CTA. However, the reduction in strength of relationship of both roles on use of the CTA gives support for the premise that the CTA is either a more stringent measure of the "intellectual" dimension or that the use of managerial norms has an impact on BTR role occurrence. However, the MBTI, N dimension (according to Myers and McCaulley 1989) is indicative in itself of Creativity and, as pointed out by Dulewicz (1995) neither 16PF Factor B nor CTA is inherently a measure of creative thinking and that, perhaps, a more appropriate measure (or qualifying factor) is required in order to fully explore this dimension.

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Table 12 : Correlations between MBTI Factors and 16PF Second Order Factors

(n = 111)

MBTI	16PF SECOND ORDER FACTORS							
	ADJ	ANX	CONT	CREA	EXTRA	INDEP	LDSHIP	TOUGH POISE
E	.3692**	-.2159*	-	-.2982**	.7012**	.3633**	.3690**	-.2255*
F	-	-	-.2535*	-	-	-	-	-
I	-.3742**	.2197*	-	.3010**	-.6853**	-.3673**	-.3864**	.2452*
J	.2366*	-	.4279**	-	-	-.2437*	-	-
N	-	-	-.2846*	.2285**	-	.2082*	-	.2252*
P	.2320*	-	-.4140**	-	-	.1926*	-	-
S	-.2094*	-	2507*	-	-	-.2251*	-	.2534*
T	-	-	.2239*	-	-	-	-.2495*	-

* P < 0.05; ** P < 0.01; *** P < 0.001

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Table 13 : Correlations between Plant, Monitor Evaluator, Creativity, 16 PFB and MBTI Factors N

(n = 111)

	PL	PL2	Watson Glaser	Creativity	MBTIN	16PF Factor B	ME	ME2
PL		.7968***	.2223*	.9576***		.3831***		
PL2	.7968***		.5413***	.7901***	.2210*			.2754**
Watson Glaser	.2223*	.5413**		.1925*	.1956*	.1825*		.5413***
Creativity	.9576***	.7901***	.1925*		.2285*	.3718***		
MBTIN		.2210*	.1956*	.2285*				
16PF Factor B	.3831***		.1825*	.3718***			.3043**	
ME						.3043**		.5082***
ME2		.2754**	.5413**				.5082***	

* P < 0.05; ** P < 0.01; *** P < 0.001

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Overall examination of these data does indicate that the MBTI profiles involving N might indicate a BTR of PL, but more notably indicate Creativity (as indicated by the 16PF second order factor). However, as Berry (1995) points out, there is virtually no difference between this 16PF second order factor and the BTR, PL role.

7. Discussion

7.1 Findings

This study does show a degree of relationship between MBTI scales and BTR's identified in the same sample.

In general the MBTI scale scores associated with BTRs in this study are in line with those expected, although not as complete as would be indicated by the theoretical linkages indicated in table 6. The comparison between the hypothesised and actual findings are summarised in table 14.

From this analysis it is evident that there is a degree of support for the hypothesis H_1 in respect of roles other than those of SH and CO. Overall six of the BTRs have a degree of association with MBTI scale scores. However, in relation to hypothesis H_2 there is somewhat less support, given that only four of the BTRs show an association with the MBTI scale scores relating to the MBTI function profiles (SN, TF). Although the associations which are found are in line with those predicted from a theoretical perspective they are far from providing complete MBTI profile to BTR associations. The **full MBTI profile** most closely indicated as linked to a BTR in this study is that of Completer Finisher.

In general the MBTI scale of Introversion:Extroversion appears to be most closely related to the predicted position on these scales from an analysis of the BTR profiles. To an extent this is a somewhat surprising finding given the significantly different meaning ascribed to this dimension within the MBTI (Myers and McCaulley 1989)

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In considering these findings the impact of the relatively low MBTI, F scores of this sample on the T : F scale compared to other populations needs to be considered. This raises the question as to how typical is this sample (even within a financial sector population).

In examining the associations, the lack of clear linkages between the MBTI profiles and the BTR, ME, role would seem to reinforce the findings of a number of other studies examining BTRs, and to underpin the need for further investigation into the nature of the ME role in particular (Dulewicz 1995).

The hypotheses that the use of the CTA, as a replacement for 16PF Factor B in the team role computation, would enhance MBTI associations (H_3 and H_4) are not borne out by this study. From the results it does, in fact, appear that this substitution depresses the relationships with ME and PL (which are the two BTRs impact on by the substitution).

In examining linkages between **MBTI scales** and **16PF second order functions** it is possible to use correlations with a degree of confidence. In examining these relationships it is evident that there is a linkage between MBTI scores on the N : S and I:E scales and other measures of "intellectual" capabilities. The relationship appears to indicate that an MBTI profile with an IN component is indicative of creativity. MBTI descriptions of high scores on the N : S scale focus on creativity, innovation and effectiveness in dealing with novel problems and situations which is reinforced by this relationship.

The absence of a clear relationship with the BTR ME role could be associated with the lack of a clear measurement of "intellectual capability" within the MBTI given the significance of this element in the calculation of the ME role from the 16PF. This conclusion is, however, somewhat limited in that the MBTI S : N scale appears (from a content analysis) to be more concerned with lateral versus vertical thinking than with intellectual capability per se.

Overall in examining the relationships between MBTI scale scores on N, CTA, 16PF factor B and the 16PF second order criterion factor of creativity raises questions as to whether or not any of these encompass real measures of divergent thinking (Dulewicz 1995).

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The BTRs were developed from the original Henley research to attempt to explain differential team performance in terms of a mix or balance of team roles. However, there is no published research showing similar relationships between the mix of MBTI profiles and team performance. Therefore, any hypothesised relationships between the two models are, at best, derivative and warrant further investigation.

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Table 14 : Hypothesised versus actual associations between MBTI and BTRs

Belbin Team Roles	Belbin/MBTI Hypothesies				Actuals
	(a) From 16PF Correlation		**(b) From Overall Analysis**		**(c) From Results**
	(i) Overall	**(ii) Core**	**(i) Overall**	**(ii) Core**	
Plant (PL)	INTP	NT	INTP	NT	I
Resource Investigator (RI)	ENGJ/P	NF/NP	ENFJ/P	NF	EN
Co-ordinator (CO)	ESTJ	ST/NT/NF	ESTJ	ST	-
Shaper (SH)	INTP	NF/NT	ESTJ	ST	-
Monitor Evaluator (ME)	ISTJ	ST	ISTJ	ST	I
Team Worker (TW)	ESTJ	SF	ESFJ	SF	EF
Implementor (I)	ESTJ	ST	E/ISTJ	ST	IJ
Completer Finisher (CF)	ESTJ	ST/NF	ISTJ	ST	ISJ

7.2 Limitations

(1) *Sample*

The current study is subject to a number of limitations which may be summarised as being:

I The Sample

The sample in this study comprised a group of managers in a life assurance organisation. In looking at the MBTI data it is clear that, although an exactly comparable group is not reported, there are differences in distributions of profiles between the sample and potentially relevant comparitor groups. Therefore, the

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potential to generalise the findings in this study beyond the immediate sample is somewhat limited.

II Statistics

The main measure of association between BTRs and the MBTI has been via scale score correlations. The limitations of this methodology have already been discussed. However, the sample size for this study provides constraints on the statistical analyses which can be employed.

In using the BTR profiles the "standard" basis employing general 16PF population norms has been used in this study. However, as Bartram (1992) pointed out there are differences between general UK population 16PF norms (Saville 1982) and those which are encountered in studying a managerial population. Although Bartram's findings are derived from a limited sub-set of the managerial population, it is likely that managerial scores on a number of 16PF factors will be higher than those in a general population mean (eg. Factor B, Extroversion etc). At the same time in using the CTA as a substitute for the 16PF factor B in calculating BTRs a managerial population norm has been employed. The use of these differing norms may limit the interpretation of the findings.

The original study which led to the development of BTRs focused on managerial populations and their performance. The MBTI scale scores, however, are based on general populations (although given the nature of the MBTI data are evidently not normed in the same way). Therefore, the differences in the target population have to be considered in interpreting and generalising from the results.

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7.3 Practical Implications

The use of the Team Management Index, based on the model developed by Margerison and McCann is widespread in organisational practice terms (Berry 1995, Employment Development Bulletin 1995). Whilst the Team Management Index purports to be based on the Jungiman Type Index rather than the MBTI, the overlap between these two instruments is significant (Berry 1995, Senior 1995). Given the results indicated in the study, questions are raised in relation to the use of these instruments to develop team role profiles and equate them to BTRs.

It may well be useful to examine within a team, the mix of MBTI profiles and compare these to effective performance in order to develop a model of mix which may be compared to the BTR model. From the current study the possibility of linking BTRs with an alternative method of measuring contribution in team performance is somewhat questionable (although the need for more detailed research into this relationship before drawing such a conclusion is clearly indicated).

In reviewing the published research it is evident that there is limited information available on the linkage between MBTI profile mix and effective performance (Berry 1995, Senior 1995). The current research indicates a derivative level of association, but one which is by no means clear.

Practitioners often use BTRs and MBTI profiles jointly to examine and build approaches to effective development (Employment Bulletin 1995, Berry 1995, Tjosvold 1991). However, the results from this study do not endorse this approach with any degree of confidence.

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7.4 Areas for Further Research

In developing the current research there was a need, indicated by the literature, to examine the relationship between two major team role models (Belbin 1981, Margerison & McCann 1985). The results indicate a need for further research into the relationship between MBTI profile mix in a team and delivered performance. This, in turn, will indicate more specific empirical relationships between the two models and delivered performance.

A number of the identified limitations of this study may well be examined further in future research. In particular there would seem to be a need to:

( ) Explore relationships between MBTI profiles (as opposed to scale scores) using more conventional techniques (eg. Chi Square tests) by obtaining a significantly larger sample.

( ) Examine the relationship between MBTI and BTR profiles using managerial, rather than general, population norms (Bartram 1992).

( ) Use a measure of divergent thinking as an element in identifying “intellectual” dimensions (Dulewicz 1995).

( ) Examine samples which more accurately reflect the distributions encountered in the use of the MBTI (Myers and McCauley 1989).

( ) Examine linkages between the mix of MBTI profiles and delivered team performance.

( ) Examine samples across a wider range of business sectors than represented by this particular study.

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( ) Further investigate the exact nature of the BTR ME role in terms of the personality components which go into the make up of the role and how it may be best predicted.

Overall the statistical limitations of this study may be overcome by further investigation using point-biserial correlation in addition to chi-square tests. In principle such an investigation is statistically viable.

8 Conclusions

The current study indicates that there are a number of relationships between MBTI scale scores, and BTRs derived from the 16PF questionnaire.

The degree and extent of these relationships are somewhat tentative and evidently warrant further investigation. In part this need derives from the nature of the sample and methods of comparison. However, the need may also be driven by issues relating to individual considerations relating to each specific instrument.

Given that two of the major models of teamworking and team performance are derived from two different underlying instruments (Belbin 1981, Margerison and McCann 1985) the findings from this study would seem to warrant further research to explore the reported apparent commonality of the models.

Furthermore, the current research has reinforced a number of published limitations of BTRs (Dulewicz 1995, Furnham et al 1993) and suggested, or reinforced, the need for further research (particularly in a commercial context) of the validity and predictive/descriptive qualities of the BTRs as derived from the 16PF (being careful not to confuse this with issues associated with the use of the BTRSPI [Furnham et al 1993, Berry 1995]).

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Appendix I

Description of Belbin Team Roles

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Type	Symbol	Typical Feature	Positive Qualities	Allowable Weaknesses
Company Worker (Implementer 1993)	CW (IM)	Conservative Dutiful Predictable	Organised ability, practical, common sense,hard-working,self-discipline	Lack of flexibility, unresponsive to unproven ideas
Chairman (Co-ordinator 1993)	CH (CO	Calm, self-confident,controlled	A capacity for treating and welcoming all potential contributors on their merits and without predjudice. A strong sense of objectives	No more than ordinary in terms of intellect or creative ability
Shaper	SH	Highly strung, outgoing, dynamic	Drive and a readiness to challenge inertia, ineffectiveness, complacency or self deception	Proneness to provocation, irritation and impatience
Plant	PL	Individualistic, serious-minded, unorthodox	Genius, imagination, intellect, knowledge	Up in the clouds, inclined to disregard practical details or protocol
Resource Investigator	RI	Extroverted, enthusiastic, curious, communicative	A capacity for contacting people and exploring anything new. An ability to respond to challenge	Liable to lose interest once the initial fascination has passed
Monitor – Evaluator	ME	Sober, unemotional, prudent	Judgement, discretion, hard-headedness	Lacks inspiration or the ability to motivate others
Team Worker	TW	Socially orientated, rather mild, sensitive	An ability to respond to people and to situations, and to promote team spirit	Indecisiveness at moments of crisis
Completer – Finisher	CF	Painstakingly, orderly, conscientious, anxious	A capacity for follow-through. Perfectionism	A tendency to worry about small things. A reluctance to 'let go'

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Appendix II

Belbin Team Role Formulae

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16 PF Team Roles Formulae

Plant (PL)	2 (11-A) + 2B + E + 2 (11-F) + H + 2I + M + (11-N)
+ Q,	
	+ 2Q2
Shaper (SH)	2F + H + 2L + 20 + 2Q4 - C - G - I
Co-ordinator (CO)	Q3 + 2G + F + 2F + C - M - 3L - A
Resource Investigator (RI)	C + H + M + Q1 - L
Team Worker (TW)	A - E - L - Q2
Implementer (I)	2 (11- I) + 2 (11-M) + (11-q1) + 2 (11-L) + g + Q3
Completer/Finisher (CF)	G + O + Q3 - Q4 - C
Monitor Evaluator (ME)	B + N - F (and only when B = Sten 8 to 10)

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Appendix III

Belbin Team Roles Derived from 16PF and Combination of MBTI Factors

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Belbin Role	16Pf Correlation	MBTI Score	Hypothesized Belbin role Correlation
Plant	-ve A -ve B -ve E -ve F +ve H +ve I +ve M -ve N +ve Q1 +ve Q2	I+T+P N E+N+T+P I+S+T+J E+N I+N+F+P I+N+F+P E+N+F+P N+T+P I+N+T+P	INTP
Resource Investigator	+ve C +ve H +ve M +ve Q1 -ve L	E+S+T+J E+N I+N+F+P N+T+P E+F+J	ENTJ ENTP ENFJ ENFP
Co-ordinator	+ve Q3 +ve G +ve F +ve E +ve C -ve M -ve L -ve A	E+S+T+J E+S+T+J E+N+F+P E+N+T+P E+S+T+J E+S+T+J E+F+J I+T+P	ESTJ
Shaper	+ve E +ve H +ve L +ve O +ve Q4 -ve C -ve G -ve I	E+N+T+P E+N I+T+P I+S+T+J I+S+J I+N+F+P I+N+F+P E+S+T+J	ENTP
Monitor Evaluator	+ve B +ve N -ve F	N I+S+T+J I+S+T+J	ISTJ
Team Worker	+ve A -ve E -ve L -ve Q2	E+F+J I+S+F+J E+F+J E+S+F+J	ESFJ
Implementer	-ve I -ve M -ve Q1 -ve L +ve G + ve Q3	E+S+T+J E+S+T+J S+F+J E+F+J E+S+T+J E+S+T+J	ESTJ
Completer	+ve G +ve O +ve Q3 +ve Q4 -ve C	E+S+T+J I+S+T+J E+S+T+J I+S+T I+N+F	ISTJ

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Belbin Role	16PF	MBTI	Likely MBTI Overall	MBTI comments
Plant	↓A ↑B ↑E ↓F ↑H ↑I ↑M ↓N ↑Q1 ↑Q2	I-TP -N- - ENTP ISTJ EN- - INFP INFP ENFP -NTP INTP	.INTP (INP)	NF NT NFP NTP
Resource Investigator	↑C ↑H ↑M ↑Q1 ↓L	ESTJ EN - - INFP - NTP E – F J	ENFJ ENFP (NTP,NTJ,NFP ,NFJ)	STJ NFP NTP ST NF, NP
Co-ordinator	↑Q3 ↑G ↑F ↑C ↓M ↓G ↓A	ESTJ ENFP ENTP ESTJ ESTJ E – FJ I-TP	.ESTJ (STJ)	STJ NFP NTP ST NT
Shaper	↑E ↑H ↑L ↑D ↑Q4 ↓ C ↓ G ↓ I	ENTP EN - - I – T P ISTJ IST – INFP INFP ESTJ	.INTP (ETJ, ETP ITJ, ITP)	NTP STJ NP NF ST
Monitor Evaluator	↑ B ↑ N ↓ F	-N- - ISTJ ISTJ	.ISTJ (STJ)	STJ SF
Team Worker	↑ A ↓ E ↓ L ↓ Q2	E – FJISFJ E – FJ ESFJ	.ESFJ (SFJ)	SFJ SF
Implementer	↓ I ↓ M ↓ Q1 ↓ L ↑ G ↑ Q3	ESTJ ESTJ - SFJ E – FJ ESTJ ESTJ	.ESTJ (STJ, SFJ)	STJ ST SF
Completer	↑ G ↑O ↑ Q3 ↑Q4 ↓ C	ESTJ ISTJ ESTJ EST – INFP	.ESTJ (STJ, NFP)	STJ NFP ST NF

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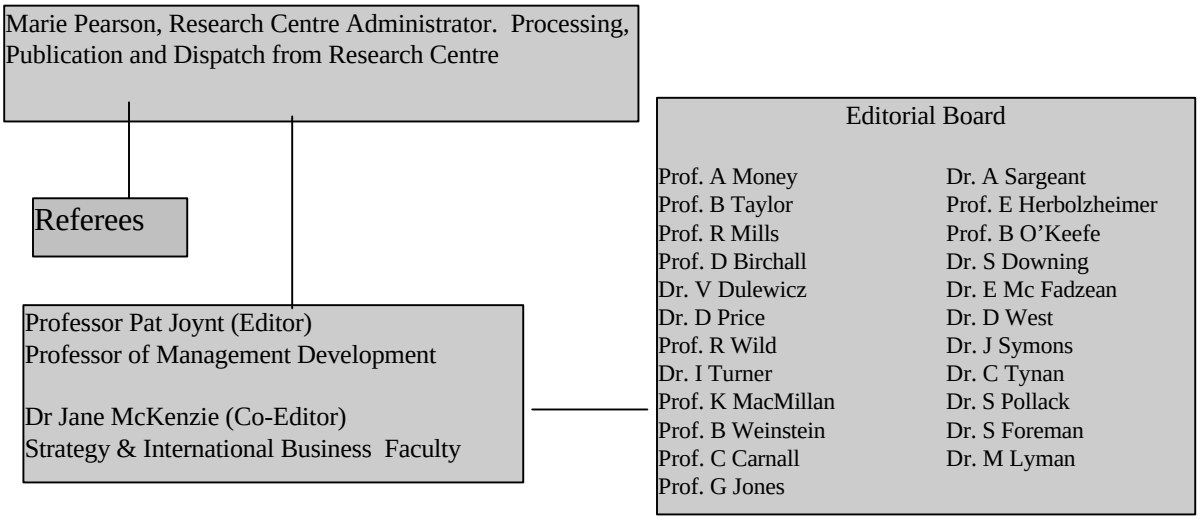

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