

# Research Memorandum

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## Team Roles: psychometric evidence, construct validity and team building

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## **Abstract**

The concept that team members perform different team roles is fundamental to studies of team diversity and its relationship to team processes and team performance. In this paper we review research that uses Belbin's (1981, 1993a) model in an effort to provide a thorough assessment of construct validity in light of conflicting claims in the literature. The model's theoretical grounding is considered in light of role theory. The psychometric properties of the inventory used to assess a person's behaviour in a team are examined together with 43 studies that have examined the relationships between team roles and other variables. While the evidence is mixed, we conclude that the model and the inventory have acceptable convergent validity. However, discriminant validity among some team roles is low. Suggestions for further research are offered.



## **INTRODUCTION**

Effective team working has become a basic concern for most organizations. While many factors influence a team's performance, considerable attention has been given to the influence of team member diversity in terms of roles played in a team. The team role model made popular by Meredith Belbin in relation to management teams (Belbin, 1981, 1993a) and available commercially through Belbin Associates (1988) is widely used in practice and has featured extensively in research on teams at work. The model is used by many organizations including FTSE-100 companies, multinational agencies, government bodies and consultants and has been translated into 16 languages.

Among the studies that have been published in relation to the model, some have been critical of the psychometric properties of the instruments used to measure team roles (Furnham, Steele, and Pendleton, 1993a, 1993b; Broucek and Randell, 1996) although others have been more supportive (Swales and McIntyre-Bhatty, 2002, 2003). There is also conflicting evidence regarding the theoretical correlates of team roles with other important areas of teamworking such as cognitive styles (Aritzeta, Senior and Swales, 2005; Fisher, Macrosson and Wong, 1998) or personality traits (Dulewicz, 1995; Fisher, Hunter, and Macrosson, 2001). Thus there is a need to bring together and contrast the evidence, and specifically to contrast psychometric evidence and empirical evidence in order to offer a definitive assessment of the theoretical and empirical foundations of Belbin's team role model.

This paper therefore reviews the published research and assesses to what extent the model is supported by the available evidence. Through its coverage of important areas of teamworking (conflict management, personality traits, team performance, control and power) the paper makes an important contribution to the practitioner and research communities by providing a fresh insight into aspects of teamworking and suggesting new research agendas.

To achieve this we first consider the theoretical context for the team role model. Second, all substantive studies that provide psychometric evidence, relationships to personality factors and evidence for predictive validity are summarised, evaluated and contrasted. Finally, we discuss the validity of the model and consider the wider implications of our findings.

## **ROLE THEORIES**

Prior to the development of Belbin's team role model (1981; 1993a) other role theories had been put forward (Benne and Sheats, 1948; Graen, 1976; Graen and Scandura, 1987; Holland, 1985) although the model's links to these and other role classifications (e.g. Davis, Millburn, Murphy and Woodhouse, 1992; Margerison and McCann, 1990; Parker, 1990; Spenser and Pruss, 1992; Woodcock, 1989) are unclear. While a comprehensive theoretical examination of the many alternative role theories and models is beyond the scope of this paper, it is important to establish a theoretical context for the team role model.

The role concept can be viewed from two different perspectives. From an anthropological-sociological perspective it can be defined as a combination of values, attitudes and behaviour assigned to an individual who occupies a social position (a location in a social network) associated with a specific social status (the functions assigned to that person). From this perspective, a role can be defined as the behaviour that a person displays in relation to his/her social position and social status (Linton, 1945). Secondly, from a psychosocial perspective, a role can be defined as the behaviour expected from an individual occupying a specific position (Biddle, 1979) such that the cognition and expected behaviour associated with the position are fundamentally important to success in the role (Katz and Kahn, 1978). This psychosocial perspective is adopted for the purposes of this review.

Since Lewin created the Research Centre for Group Dynamics in 1944, two types of groups have been studied: groups created to solve problems and groups preoccupied with individual development. This duality has brought about a distinction between so-called “task roles” and “socio-emotional roles”. In this light, Bales and Slater (1955) studied laboratory groups and concluded that there were significant differences between individuals concerned with solving tasks and individuals concerned with the social and emotional needs of group members. People concerned with solving tasks were called “task leaders” whereas those concerned with emotional needs were called “maintenance or socio-emotional leaders”. Similarly, Benne and Sheats (1948) proposed a role behaviour classification describing 12 task roles and seven maintenance roles. Task-centred roles were concerned with the coordination of group problem solving activities, whereas maintenance roles were concerned with promoting group-centred behaviour. Both role types were thought necessary for a team to perform well. These theoretical antecedents formed the pillars of the development of the team role model (Belbin, 1981) as its general framework and the names of some team roles connect to these and other theories (Fisher, Hunter, and Macrosson, 2001).

Among theoretical models explaining how roles are acquired a two-part classification can be made (Ilgen and Hollenbeck, 1991). First, there are ‘role taking’ models that consider individuals as passive acceptors of the roles assigned to them by others (Graen, 1976). An example is the ‘role episode model’ (Katz and Kahn, 1978) where the role is defined by an interaction process between two people: the person performing the role (the focal person) and another who holds a set of beliefs that constitute the role (the role sender). The role sender communicates a set of beliefs and the focal person assumes them. The second classification of role models sees subjects actively participating in the definition and development of their role. These models assume that individuals are much more active and motivated to possess roles that they can perform successfully. They are called ‘role making’ models because the focal person actively attempts to influence the role sender as they try to build a role that will be acceptable to both of them. Graen and Scandura (1987) proposed the ‘theory of dyadic organizing’ which integrated and extended Graen’s first proposal (1976). This theory describes how members of a team coordinate their activities to accomplish tasks that are not prescribed in their positions but fundamental for the effective

functioning of the team. The model analyses dyadic interactions and also takes into account the team as a whole or, in their terms, the dyadic structure.

When a job role involves very predictable tasks, assigning individuals to roles is relatively easy. However, as work becomes more complex then so do the abilities required by individuals. The question is no longer about the abilities and knowledge a person should have for a specific job but is about predicting how a person will behave in the work unit where the work will be performed. In this sense, Holland (1985) proposed one of the first models that accounted for this individual context adjustment suggesting that individuals and job environments can be classified in six different types: 'realistic', 'conventional', 'entrepreneur', 'social', 'artistic' and 'intellectual'. Each type is associated with specific activities and abilities possessed by individuals. A set of adjectives characterized each type. For example, the intellectual type is described as *analytical, cautious, critical, inquisitive, independent, pessimistic and reserved*. For individuals to be successful and satisfied in a job, their personal abilities, interests and personality traits should adjust with the requirements, rewards and interpersonal relations offered by the job consistent with individual job adjustment theory. Holland (1985) proposed that an individual may display attributes of more than one type and also that there are compatible and incompatible types: for example, 'intellectual' and 'artistic' types are more compatible than 'artistic' and 'conventional' types. Belbin's team role model can be linked to these role theories and role classifications.

We now turn to review the literature on the team role model drawing upon studies using the Team Role Self Perception Inventory (TRSPI) through which it is operationalised. We also draw upon team role assessment using personality questionnaires and review empirical studies that have explored the theoretical network of team role constructs in an attempt to better understand how individual team role preference is related to the behavioural definition of team roles as well as to other important areas of teamwork behaviour.

## **THE TEAM ROLE MODEL**

As with most role theories, Bebin's model is not preoccupied with the roles (behavioural patterns) *per se* but with the ways in which the roles develop, change and interact with other patterns of behaviour over time. The model was proposed after a nine-year study of team building and team effectiveness with management teams taking part in an executive management exercise at the Henley Management College, England. Prior to participating in the exercise, individuals completed Cattell's 16PF personality questionnaire and Watson Glaser's Critical Thinking Appraisal. For each management team an observer recorded group processes based upon Bales' (1950) interactive process analysis and wrote a report based on their observations. Successful and less successful teams were analysed in terms of their members' personalities and in terms of their critical thinking abilities. Analyses were then cross-referenced with observers' reports and, as a result, eight team roles were proposed. The initial categorisation of team roles was therefore based on assessments of team members' personalities, critical thinking abilities and a behavioural checklist. The only empirical evidence of the early analysis

showed a positive correlation between performance predictions based on team role composition and actual performance across 22 teams (Belbin, Aston, and Mottram, 1976, p.26).

The 8-role model was introduced (Belbin, 1981) and a team role was defined as a pattern of behaviour characteristic of the way in which one team member interacts with another in order to facilitate the progress of the team as a whole. Names and descriptive adjectives for each of the eight team roles were also included. In 1993 some team roles were renamed and a ninth role added. The nine roles are; Completer-Finisher (CF), Co-ordinator (CO), Implementer (IMP), Monitor Evaluator (ME), Plant (PL), Resource Investigator (RI), Shaper (SH), Specialist (SP) and Teamworker (TW) and descriptions of each role are given in Table 1.

**Table 1. Team Role Descriptors, Strengths and Allowed Weaknesses**

Team Role	Descriptors	Strengths	Allowed Weaknesses
Completer Finisher (CF)	Anxious, conscientious, introvert, self-controlled, self-disciplined, submissive and worrisome.	Painstaking, conscientious, searches out errors and omissions, delivers on time.	Inclined to worry unduly. Reluctant to delegate.
Implementer (IMP)	Conservative, controlled, disciplined, efficient, inflexible, methodical, sincere, stable and systematic.	Disciplined, reliable, conservative and efficient, turns ideas into practical actions.	Somewhat inflexible. Slow to respond to new possibilities.
Team Worker (TW)	Extrovert, likeable, loyal, stable, submissive, supportive, unassertive, and uncompetitive.	Co-operative, mild, perceptive and diplomatic, listens, builds, averts friction, calms the waters.	Indecisive in crunch situations.
Specialist (SP)	Expert, defendant, not interested in others, serious, self-disciplined, efficient.	Single-minded, self-starting, dedicated; provides knowledge and skills in rare supply.	Contributes on a narrow front only. Dwells on technicalities.
Monitor Evaluator (ME)	Dependable, fair-minded, introvert, low drive, open to change, serious, stable and unambitious.	Sober, strategic and discerning, sees all options, judges accurately.	Lacks drive and ability to inspire others.
Co-ordinator (CO)	Dominant, trusting, extrovert, mature, positive, self-controlled, self-disciplined and stable.	Mature, confident, a good chairperson, clarifies goals, promotes decision making, delegates well.	Can be seen as manipulative. Offloads personal work.
Plant (PL)	Dominant, imaginative, introvert, original, radical-minded, trustful and uninhibited.	Creative, unorthodox, solves difficult problems.	Too preoccupied to communicate effectively.
Shaper (SH)	Abrasive, anxious, arrogant, competitive, dominant, edgy, emotional, extrovert, impatient, impulsive, outgoing and self-confident.	Challenging, dynamic, thrives on pressure, has drive and courage to overcome obstacles.	Prone to provocation. Offends people's feelings.
Resource Investigator (RI)	Diplomatic, dominant, enthusiastic, extrovert, flexible, inquisitive, optimistic, persuasive, positive, relaxed, social and stable.	Extrovert, communicative, explores opportunities, develops contacts.	Over-optimistic, loses interest after initial enthusiasm.

Source: Belbin (1993b, p.22)



In this model a role is defined by six factors: personality, mental ability, current values and motivation, field constraints, experience and role learning. However, Belbin did not show how much of the variance in a team role is explained by each factor. In keeping with others (Benne and Sheats, 1948; Torrington, Weightman, and Johns, 1985), Belbin defends the idea that high performing teams need to have a balanced representation of all team roles. The team role balance hypothesis assumes that if all team roles are present in a team then it will perform better than other teams without the balance. Belbin also considers that the team role concept (a preference to behave in a particular way with other team members while performing tasks) should be distinguished from the concept of functional role which refers to the technical skills and operational knowledge relevant to the job. Consequently, several people may have the same functional role but vary greatly in their natural team role(s).

Belbin also stresses the link between the stages of a team's development and the need for different team roles to dominate at different stages. Six different stages of development are proposed: 1) identifying needs, 2) finding ideas, 3) formulating plans, 4) making ideas, 5) establishing team organization and 6) following through. In the early stages team roles like Shaper and Co-ordinator will be most needed whereas in the later stages Completer-Finishers and Implementers make higher contributions.

### **Operationalising the Model**

The team role model is ideally operationalised through a self-perception inventory and through observers' assessments to give a rounded assessment of a person's team role. The original Team Role Self Perception Inventory (TRSPI-8R) was hand-scored such that respondents computed their own profile. This version was later modified to embody the nine-role model (TRSPI-9R) and for this version respondents' profiles are generated by the *Interplace* computer package. Since it was never intended that the TRSPI should be the only input to exploring a person's team role, an Observer Assessment Sheet (OAS) was also designed to be used by work colleagues who could make an informed judgement based on their knowledge of the person. The OAS should be used alongside the TRSPI although in many situations only the inventory is used. Details of the scoring procedures for these instruments are given in Appendix 1.

The second way of assessing team roles is derived from personality questionnaires and equations to derive team roles have been developed in conjunction with personality questionnaire publishers. In particular, Cattell's Sixteen Personality Factor Questionnaire (16PF, Cattell, Elber, and Tatsuoka, 1970) and the Occupational Personality Questionnaire (OPQ, Saville, Holdsworth, Nyfield, Cramp, and Mabey, 1992) have been used (see Dulewicz, 1995).

### **Reviewing the Evidence**

Appendix 2 at the end of this paper summarises 43 substantive studies of the team role model using the TRSPI, OAS and personality inventories. The

appendix includes the purpose of each study, its aims, instruments and sample used as well as the main results and conclusions. Based on the purpose of each study, an indication of whether the findings were positive, negative or mixed in terms of the model and its measures is offered.

### *Psychometric Evidence*

Eight studies have analysed the psychometric properties of the TRSPI and two have reported results from the OAS. Initial evaluations were critical (Furnham, Steele, and Pendleton, 1993a, 1993b; Broucek and Randell, 1996) and one study arrived at mixed conclusions (Beck, Fisch, and Bergander, 1999). Recent studies have been more supportive of the TRSPI's reliability and structure (Swales and McIntyre-Bhatty, 2002, 2003). Since the first criticism of the TRSPI (Furnham et al., 1993a), other researchers have raised concerns about the statistical properties of the original inventories as well as their theoretical basis (Broucek and Randell, 1996). An important issue affecting psychometric evaluation of the TRSPI stems from its ipsative nature which is outlined in Appendix 1.

#### *Evidence for the TRSPI*

As shown in Appendix 2, Furnham et al. (1993a) reported low reliability values for three different versions of the TRSPI. Correlations between team roles were different for a normatively scored (Likert scale) version ( $M = .36$ ) and the original ipsative version ( $M = -.29$ ). Factor structures were also different for normative values (two well-defined task and socioemotional factors) and for ipsative scoring (four bipolar factors). Both, Senior (1998) and Beck et al. (1999), in their respective exploratory factor analyses, also reported an underlying four factor structure for the ipsative version of the TRSPI. However, the ipsative design of the TRSPI was deliberate and any comparison of forms should recognise that transforming the ipsative structure of the instrument will inevitably alter its nature. (See Belbin (1993b) for a rebuke of the normative version). In the ipsative form the average interscale correlation will be negative (Meade, 2004) whereas in a normative form scales are allowed to correlate freely. In this context, Furnham et al. (1993a) raised concerns about the theoretical basis of the inventory and a lack of evidence for its psychometric properties noting that the test was, "neither theoretically nor empirically derived as Belbin developed his team role typology based on observatory and inductive, rather than theoretically deductive means" (p.247) with a limited sample of 78 managers.

Similarly, Broucek and Randell (1996) raised concerns about the internal consistency and discriminant validity of the TRSPI and the OAS. They also noted that both tests could not be considered as parallel forms of the same construct. The average correlation between team roles was .27 for ipsative scoring and .42 for normative scoring and higher correlations were expected from the self-reported data collected by both tests. Similarly, Senior and Swales (1998) also reported that both TRSPI and OAS did not show high convergent validity as only five team roles showed significant correlations with an average of .27. Broucek and Randell (1996) also reported that different

correlations were found between the normative and ipsative versions of the TRSPI and the NEO-PI-(R) personality scale although 8 out of 19 predictions for the ipsative version and 14 out of 19 for the normative version were correctly hypothesised. Different correlation values were taken as a “dramatic evidence of the type of distortion which use of an ipsative instrument produces” (p.401). Similarly, Fisher, Macrosson, and Sharp (1996) looked at the correspondence between the TRSPI and 16PF and found low correlation values on the validity diagonal. Broucek and Randell also tested the discriminant validity of the OAS against the NEO-PI (R) Big Five personality factors although Fisher, Hunter and Macrosson (2001, pp. 125-126) noted that such analysis was dependent on the orthogonality of the personality factors and, as far as the factors have been found to be oblique (Costa and McCrae, 1992), any conclusion regarding the discriminant validity of the OAS should be taken cautiously.

As mentioned above, Swailes and McIntyre-Bhatty (2002; 2003) reported more positive assessments of the TRSPI. They used a new formula unrelated to scale length to calculate internal consistency values for team roles, based on the average inter-item correlation. New values using a large data set of 5,003 managers produced internal consistency estimates close to or above the .70 threshold except for the Implementer role. Similarly, in an analysis of scale structure, unifactorial structure was found for six scales with Completer-Finisher, Implementer and Shaper showing a better fit to a two factor solution. Both sets of analysis show stronger support than any previous studies for the reliability of the TRSPI. They point out that many previous studies reporting low reliability had used samples of students for whom the TRSPI was not designed and whose capacity to respond meaningfully to many of the items must be questionable. Of greater importance, in estimating reliability from small samples much of the data analysed in the critical studies came from the scores of zero assigned to ‘missing’ data to enable the calculations (private communications). The TRSPI is scored in such a way that respondents leave about half of the items blank, i.e. they are unscored. To estimate reliability, researchers had turned the blank scores into zero in order to produce correlation matrices for analysis. The matrices produced were thus heavily influenced by the replacement of ‘missing’ data negating the influence of the items that had been given scores by respondents. It is unclear whether replacing ‘missing’ data is appropriate in this situation and, even if it is, simple replacement with zero may not be correct. Working with a large sample, Swailes and McIntyre-Bhatty (2002) showed that reliability was higher when estimated from scored items only.

#### *Evidence from personality measures of team roles*

Three studies have analysed the psychometric properties of team role measures derived from personality inventories. This line of research, mainly led by Fisher and colleagues and the early work of Dulewicz (1995), occurs for two reasons. First, initial analysis indicated that both the TRSPI and OAS had poor reliability, poor construct and convergent validity and the use of personality questionnaires to derive team roles overcomes these limitations (Furnham et al., 1993a; Broucek and Randell, 1996). Second, it is argued that

Belbin worked closely with personality questionnaire publishers at different times to develop equations to derive his team role measures. Although not explicitly stated, this line of research assumes that personality traits are the basic components underlining team roles constructs.

The first of these studies (Dulewicz, 1995) intended to offer valid and reliable measures of team roles. After showing the importance of personality measures in Belbin's early work, Dulewicz correlated and factor structured team roles using 16PF and OPQ measures. Based on the correlations between team roles, low discrimination between roles was reported. He argued that poor discriminant validity between team roles was due to some personality factors contributing to many of the team role equations for both 16PF and OPQ (Dulewicz, 1995, p. 94). He also found that previous classifications of pairs of roles (Belbin, 1988) and exploratory factor analysis of the TRSPI (Beck et al., 1999; Furnham et al., 1993a; Senior, 1997) were not supported. In this sense, Dulewicz argues that much of the confusion about team role pairings is due to a lack of differentiation between the tasks and functions that a role holder performs and the personality characteristics that define the role. If Plants and Monitor-Evaluators are considered intellectuals, but both display two different intellectual roles, they will also have different personality traits. "Therefore, it seems inappropriate for Furnham et al. (1993a) to test the team role theory by seeking significant correlations between the four pairs of roles" (Dulewicz, 1995, p.95).

The factor structures observed by Dulewicz shared some similarities between both personality measures, thus some support for the construct validity of the team role model is claimed. Similarly, correlations between team roles derived from both questionnaires show high inter-method/equivalent form reliability and construct validity, though the average correlation of the validity diagonal (.35) is taken by Fisher, Hunter and Macrosson (2001, p. 125) as a signal of poor "inter-method/equivalent form reliability".

Fisher and colleagues generated a stream of research on team roles using personality questionnaires. Three of their studies have been concerned with the validity and reliability of team roles derived from 16PF (Fisher, Macrosson, and Sharp, 1996; Fisher, Hunter, and Macrosson, 1998; Fisher, Hunter, and Macrosson, 2001). Fisher, Hunter and Macrosson (1998), using a multidimensional scaling technique, showed that team roles were grouped into two distinct factors that clustered Co-ordinator, Team Worker, Resource Investigator and Implementer in a "relationship" cluster and Plant, Monitor Evaluator, Shaper and Completer Finisher in a "task" dimension. Again, these results have little in common with results reported by Dulewicz (1995) but seem to echo partially those of Furnham et al. (1993a) from their normative version of the TRSPI (see Appendix 2).

The work of Fisher, Hunter and Macrosson (2001) is one of the most rigorous validation studies in terms of combining different methods to derive team roles. Besides the classical 16PF and OPQ questionnaires an independent observational methodology was used in a business simulation exercise. These measurements were analysed using a multitrait-multimethod approach followed by a confirmatory factor analysis. The multitrait-multimethod matrix

analysis provided support for convergent validity but less support for the discriminant validity of team roles. (Discriminant validity in this case means clear discrimination among the nine roles). However, the convergent and discriminant validity of the team role model could not be confirmed by confirmatory factor analysis as too many similar personality traits were shared by different team roles - an aspect previously noted by Dulewicz (1995).

Fisher, Hunter and Macrosson (2001) reduced trait multicollinearity by combining pairs of team roles and their average scores in a step-by-step method. A statistically meaningful factor structure was found only after six team roles were put into three pairs (Implementer and Resource Investigator; Co-ordinator and Team Worker; Completer Finisher and Shaper) and two others were unpaired (Plant and Monitor Evaluator). These groupings fitted with the NEO-PI-R five factor model of extraversion, conscientiousness, openness, agreeableness and neuroticism respectively, which was taken as evidence for convergent validity. Broucek and Randell (1995, p. 400) also found Resource Investigator positively related with extraversion, Monitor Evaluator with conscientiousness, Plant with openness, Team Worker with agreeableness and Completer Finisher with neuroticism although the correlations were clearer for the normative version of the TRSPI than the ipsative version. Fisher, Hunter and Macrosson (2001) concluded that Belbin had probably been unwittingly identifying the "Big Five" personality traits while observing his teams and that the evidence for the predictive power of the Big Five model might help to develop a team role model with a clearer theoretical grounding.

#### Factor structures

It should be pointed out that the bi-polar factor structure reported previously (Furnham et al., 1993a) and those reported by Senior (1998) and Beck et al. (1999) have no obvious counterparts within the structures of the 16PF or the OPQ. These results, in light of Dulewicz (1995, p.96), do not lend support for the TRSPI. However, while reliability and factor structures of within-scale scores (eg, Swailes and McIntyre-Bhatty, 2002, 2003) can be justified as within-scale ipsativity is low, factor analysis of between-scale scores is of limited use at best given the higher levels of ipsativity. This arises from the nature of ipsative data in which correlations are 'forced' due to scores for one variable influencing the scores for another (see Baron, 1996; Meade, 2004; Saville and Wilson, 1991). With that caveat, Table 2 summarises factor structures found by using ipsative and normative versions of the TRSPI and personality questionnaires. Three different result patterns can be observed.

**Table 2. Exploratory Factor Analysis of Team Roles, using both TRSPI and Personality Questionnaires**

Studies	Factor 1	Factor 2	Factor 3	Factor 4
Furnham et al. (1993a) TRSPI-8R	PL vs. IMP	SH vs. TW	ME vs. RI	CO vs. CF
Senior (1998) TRSPI-9R	SH+RI vs. TW+SP	PL vs. IMP+CF	CO vs. SP	ME vs RI?
Beck et al. (1999) TRSPI-9R	PL vs. IMP	CO vs. SP	SH vs. TW;	ME vs. DR
Dulewicz (1995) 16PF	CF vs. RI	PL vs. TW;	CO+IMP	SH vs. ME
Furnham et al. (1993a) normative TRSPI-8R	SH+RI+ME+ PL+CO	TW+CF+ IMP+CO		
Furnham et al. (1993a), normative TRSPI-9R	ME+SH+CF +CO+IMP+RI	TW+SP+CF+IMP	PL+RI	
Dulewicz (1995) OPQ	IMP+CF+ME	CO+RI+TW	PL+SH vs. TW	

**Note:** Threshold for factor loading contribution was 0.50

From the eight- and nine-role versions of the TRSPI some predictable results have appeared. For example, the imaginative and unorthodox Plant appears opposed to the more controlled and disciplined Implementer. Similarly, the dominant and competitive Shaper opposes the submissive and uncompetitive Team Worker. Beck et al. (1999) and Senior (1997) show that Co-ordinator opposes Specialist which is logical since Co-ordinators are defined as mature chairpersons, whereas Specialists are less interested in others and tend to be single-minded. Finally, Monitor Evaluator appears opposed to Resource Investigator (Furnham et al., 1993a; Senior, 1997) although Senior argued that Resource Investigator has little standing as a role in its own right. Both of these team roles have contrasting adjectives, for example, Monitor Evaluators are defined as dependable and unambitious, whereas Resource Investigators are persuasive and dominant. These three studies have thus reported two similar bipolar factors where Plant and Implementer, Shaper and Team Worker were seen as opposing team roles. Belbin (1988, p.123) proposed a classification of role pairings in which Resource Investigator and Team Worker are seen as negotiators, Implementer and Completer Finisher are seen as managers/workers, Monitor Evaluator and Plant as intellectuals and Coordinators and Shapers as leaders. However, although the factor structure of the TRSPI appears stable across studies, none of the results supported the

four higher-order team role classification probably because it was based on characteristics rather than opposing traits.

The second group of results refers to normative versions of the TRSPI (Furnham et al., 1993a). In the eight role version two factors were identified. Factor one was composed of mainly task oriented roles whereas factor two loaded team roles concerned with others. In the nine role version a similar result was observed with the exception that Plant and Resource Investigator appeared grouped on a third factor. These factor structures do not differ much from the classical task and socioemotional role differentiation mentioned earlier (Bales, 1950). As noted above however, it is important to appreciate that in creating a normatively scored version of the TRSPI, and thus data suited to factor analysis, the instrument loses its intended structure and it is arguable whether like is being compared to like. Hence, these results should be treated cautiously (see Belbin, 1993b).

Finally, Dulewicz (1995) reported the factor structures of the 16PF and the OPQ. The 16PF showed a four factor structure of which three factors were bipolar. No counterparts could be found with any of the previous studies, though the structure appeared theoretically consistent with factors loading Plant and Team Worker, Shaper and Monitor Evaluator, Completer Finisher and Resource Investigator. On the other hand, the factor structure of the OPQ was different from the 16PF, being closer to the normative version's factor structure reported by Furnham et al. (1993a).

The fact that the 16PF factor structure has no correspondence with other bipolar structures previously reported raises the next question: are both TRSPI and the personality inventories measuring the same constructs? In relation to this question, Fisher et al. (1996) showed that test-retest reliabilities of team roles measured by the TRSPI were lower than for measures derived from 16PF. These results can be considered as a sign that team roles measured by the TRSPI reveal a more dynamic structure and show higher context dependency than personality traits which are considered to be stable over time. Pre-test/post-test studies on team role ambiguity have shown that after time working in teams, individuals show higher team role clarity (Aritzeta and Ayestaran, 2003; Aritzeta, Ayestaran, and Swailes, in press). Similarly, Watkins and Gibson-Sweet (1997) showed that team members were able to display non-natural team roles to supply the team with team roles that were needed. This evidence suggests that TRSPI and personality measures of team roles may be measuring different constructs.

Taken overall, the evidence from the psychometric properties of different measures used to analyse team roles is far from uniform. Independently of the method used, a common result is that there are strong associations between pairings of team roles such that discrimination between some roles is low. Therefore we raise the question about the real existence of nine well-differentiated team roles and whether these team roles, in fact, are better differentiated using some other grouping suggested in the literature.

## *Empirical Studies*

The team role model has been associated with many areas of teamworking and several studies have analyzed the model's ability to predict team performance. The 'team role balance hypothesis' states that high performing teams need to display all the functions represented by the nine team roles acknowledging that an individual may display two or three natural roles. Thus, balanced teams are those where all team roles are present. Other studies have observed the team role model in relation to the role preferences of women and men, type of organization, the cognitive styles of team members and links between team roles and conflict management.

Twenty seven studies have empirically or conceptually tested the team role model using either the TRSPI or personality inventories to measure team roles. Of these, five have reported negative evidence. These related to a potential gender bias of the instrument (Anderson and Sleaf, 2004), to the prediction of team performance (Jackson, 2002; Partington and Harris, 1999), to associations between team roles and a physiological measure of brain dominance (Sommerville and Dalziel, 1998) and to relationships with the Team Management System role model (Rushmer, 1996). Eighteen studies have reported positive evidence including team roles in relation to management styles (Lessem and Baruch, 2000), to team performance (Aritzeta and Ayestaran, 2003; Senior, 1998), to cognitive styles (Aritzeta, et al., 2005) and to the exercise of power and control (Fisher, Macrosson, and Semple, 2001). A summary of empirical studies is now provided.

### *Studies of the Balanced Team Performance Hypothesis*

Senior (1997), in providing one of the most cited studies on the relation between team roles and team performance, studied 11 management teams using the Repertory Grid Methodology (Stewart and Stewart, 1981). Team roles were identified using both the TRSPI and the OAS. In her study each team member participated in a one-to-one interview so that their perception of team performance could be classified (see also Senior and Swailes, 2004). Senior showed that performance was related to measures of team role balance. Similarly, Prichard and Stanton (1999) also showed that teams with a diverse combination of team roles perform better than teams mainly composed of Shapers: evidence partially supporting the team role balance hypothesis. Jackson (2002) studied the capacity of team roles to predict team performance compared to the Learning Styles Questionnaire and found no evidence to support team roles using the TRSPI.

Aritzeta and Ayestaran (2003) observed positive evidence for the team role balance hypothesis as 56% of their mainly female work teams were balanced (all team roles were present in the team). However, using the same criteria, Park and Bang (2000) found that only the 4% of their mainly male dominated work teams were balanced and could not find evidence to support the team role balance hypothesis. Gender differences between both studies could explain differences observed with respect to team role balance.



Balderson and Broderick (1996) found differences between men and women only on the Monitor Evaluator and Plant roles which were higher for women. Sommerville and Dalziel (1998) showed a higher predominance of Team Workers among women and both Implementers and Co-ordinators among men. Similarly, Anderson and Sleaf (2004) showed that women scored significantly higher on Team Worker and men on Shaper, Plant and Monitor Evaluator roles, contradicting Balderson and Broderick's findings. Anderson and Sleaf report that the TRSPI-8R tends to favour males on leadership roles (Coordinator and Shaper) and in this sense, team role measurement using the TRSPI has been considered to be excessively task oriented (Beck et al., 1999). Future research should focus on gender composition of groups, its influence on role adjustment and the effects on team role balance and performance.

#### *Type of management and organization*

Lessem and Baruch (2000) found that managers prioritising change and development showed preferences for Co-ordinator, Plant and Shaper roles. These results are reinforced by the idea that in heterogeneous and change-oriented organizations a higher predominance of Plant and Resource Investigator roles is found (Shi and Tang, 1997). On the other hand, organizations that are relatively homogeneous and stable showed a higher preference for Implementer and Completer-Finisher team roles. Arroba and Wedgwood-Oppenheim (1994) indicated that Shaper and Implementer roles occurred more among senior managers in local government than in private sectors where Plant, Team Worker and Completer Finisher occurred more frequently. Hence, there are indications of a differential attraction between team role types and broad organisational type. Shaper, Plant, Resource Investigator and Co-ordinator seem to readily fit dynamic and changing contexts. Implementer and Completer-Finisher seem better adjusted to more stable contexts. This finding is reinforced by studies analysing the association between individual cognitive styles and team role preferences that show an isomorphic pattern between organizational and individual level analysis and which are discussed below.

#### *Cognitive styles and conflict management*

The convergent validity of the TRSPI and Kirton's (1989) adaption-innovation cognitive styles was first addressed by Fisher, Macrosson and Wong (1998). Using the 16PF questionnaire, they found a positive correlation between Resource Investigator and Shaper and innovative cognitive style. A high innovator is defined as an undisciplined thinker, tangentially approaching tasks from unsuspected angles and someone that searches for alternative ways to solve problems. High innovators manipulate problems and are able to catalyse and settle groups, though sometimes being irreverent about their consensual views. On the other hand, Completer Finisher, Implementer and Monitor Evaluator were associated with the adaptive cognitive style. A typical Adaptor is characterized by precision, reliability, efficiency, prudence, discipline and conformity. S/he is concerned with resolving problems thrown up by the current paradigm, approaching them through continuity and stability

and seeking solutions in tried and understood ways. Finally, Co-ordinators were seen as displaying mediating, bridging, behaviour between Adaptors and Innovators that moderates tension between high Adaptors and Innovators.

Fisher, Macrosson and Wong (1998) concluded that correlations between the Kirton Adaptor-Innovator (KAI) subscales and team roles were disappointing. However, more recent work (Aritzeta, et al., 2005), has shown that the disappointing results were due to a misinterpretation of KAI sub-scale scores (scoring direction was reversed) with inevitable adverse consequences for coherent subscale correlations. With this correction, in both studies, the correlations between team role scores and innovation were almost identical. Shaper and Resource Investigator (also Plant in the study by Aritzeta, et al., 2005) were related to the innovative cognitive style and Implementer, Team Worker and Completer Finisher to the adaptive style. Both Co-ordinator and Monitor Evaluator were seen as displaying bridge roles. Similarly, recent work found that team roles were related to conflict management behaviour, showing that Plant and Shaper were positively related to dominating behaviours, and Implementer, Completer-Finisher and Team Worker with avoiding behaviour (Aritzeta, et al., in press). In this study, Co-ordinator and Resource Investigator showed a positive correlation with compromising behaviour after four months of teamworking. These three studies are consistent. Team roles are coherently associated with cognitive styles and conflict managing behaviour, which constitutes positive evidence for the validity of the team role model.

#### *Control, power and Machiavellianism*

Other studies using the 16PF showed evidence supporting the construct validity of the team role model. For example, Fisher, Macrosson, and Semple (2001) analyzed whether control and power operated in Belbin's team roles and found that Co-ordinator, Resource Investigator and Shaper expressed higher levels of control or tried to exert control over others rather than accepting control from them. Moreover, Macrosson, and Hemphill (2001) argued that some of the definitions of team roles could be hiding Machiavellian behaviour. In their study, Shaper and Plant were positively related to Machiavellian behaviour and Co-ordinator, Implementer and Team Worker appeared negatively related to it.

#### *Team roles for non-managers?*

Some evidence has shown that Belbin's model should not be limited to management teams as, "the behaviours which each of the team roles bring to the process of making decisions are needed universally, irrespective of the level of the organization in which that activity occurs" (Fisher, Hunter, and Macrosson, 2002, p.15). They found no differences between managers and non-management teams in terms of team role frequencies and team performance, reinforcing the idea that the model can also be applied to non-managerial roles. This, more universal, nature of team roles has also been addressed by Fisher and Macrosson (1995) who predicted team role preferences from an individual's family environment. They reported that the

cohesion subscale of the family environment survey (commitment and help and support among family members) was predictive of Implementer, Co-ordinator and Team Worker roles. On the other hand, conflict and achievement orientation were predictive of the Shaper role.

In an expanded application of team roles, Dulewicz and Higgs (1999) correlated dimensions of a new questionnaire to measure emotional intelligence with 16PF measures of team roles. They found that Co-ordinator and Resource Investigator showed similar correlation patterns with an emotional intelligence subscale (self-awareness, resilience, motivation, influence) sharing with Implementer two positive subscale correlations. Shaper and Completer-Finisher showed a negative correlation with total emotional intelligence.

### *Summary of Empirical Studies*

Taking the empirical studies together, there is sufficient evidence that definitions of team roles are valid and that independently of the instrument used to measure team roles, results are consistent with other theoretical models. The team role model shows evidence for validity that cannot be disregarded and this is presented in Table 3. Knowing the type of association that a team role shows with individual cognitive styles, conflict managing behaviour and the other areas explored will help to better understand team dynamics and facilitate team building activities. Table 3 shows the theoretical commonalities among team roles and other constructs.

**Table 3. Theoretical Commonalities among Team Roles**

<b>Team Role</b>	<b>Theoretical association</b>
Completer Finisher	Adaptive cognitive style; tries to avoid conflict; low emotional intelligence; high moral values
Implementer	Adaptive cognitive style; tries to avoid conflict; low Machiavellianism; cohesion; low intellectual orientation; high moral values
Team Worker	Bridge/Adaptive cognitive style; tries to avoid conflict; low Machiavellianism; cohesion
Specialist	Adaptive cognitive style; in conflicts will try to dominate or use avoiding behaviour
Monitor Evaluator	Bridge/ Adaptive cognitive style
Co-ordinator	Bridge; attempts to control; in conflicts tries to find a compromise; low Machiavellian; high emotional intelligence; cohesion
Resource Investigator	Innovative cognitive style; attempts to control; in conflicts tries to find a compromise; high emotional intelligence; low conflict
Plant	Innovative cognitive style; in conflicts tries to dominate; shows Machiavellian behaviour; low cohesion; intellectual orientation
Shaper	Innovative cognitive style; attempts to control; in conflicts tries to dominate; shows Machiavellian behaviour; achievement orientation; low emotional intelligence; conflict

Note: Only constructs shared by at least two team roles have been included.

If the associations in Table 3 are cross-referenced with the factorial structures shown in Table 2 a global picture of the team role model emerges. First, both the empirical associations between team roles and other theoretical constructs and factorial structures of the TRSPI show similar patterns. For example, Plant is related to an innovative cognitive style, dominating conflict management behaviour and Machiavellianism. In contrast Implementer is related to an adaptive cognitive style, avoiding conflict management behaviour, high moral values and family cohesion.

Similarly, Shaper is associated with innovative cognitive style, dominating and controlling behaviour and achievement as opposed to Team Worker which is related to an adaptive cognitive style and avoiding behaviour in conflicts. Finally, other coherent though less clear pairings appear. One refers to Resource Investigator which is related to Innovative cognitive style, attempting to control and seeking compromising behaviour in contrast to Monitor Evaluator which is associated with a bridging/adaptive cognitive style. Co-ordinators are observed as displaying bridging behaviour and attempts to control others while using compromising behaviour when dealing with conflict. On the other hand, Specialists are related to an adaptive cognitive style and both dominating and avoiding behaviour (not caring about others). The factor structure of the 16PF (Dulewicz, 1995) also shows a bipolar structure with pairs of team roles that have been found to be differentially related to other theoretical constructs. Again, the innovative and dominating Plant contrasts with the adaptive and avoiding Team Worker. The same can be said for Shaper and Monitor Evaluator and for Completer Finisher and Resource Investigator.

Similarities can also be observed between theoretical team role associations and factor structures of the normative versions of the TRSPI and the OPQ. The only difference from the classification made above is that in these two cases the factorial structure shows two or three unipolar factors. For example, in the normative versions of the eight role TRSPI, Furnham et al. (1993a) reported that Shaper, Plant and Resource Investigator contrasted with Team Worker, Completer-Finisher and Implementer. As shown in Table 3, these first three team roles share the same cognitive style; Resource Investigator and Shaper share their attempts to control and Plant and Shaper share a dominating conflict managing style. Similarly, in the nine role version, though the first factor is less clear, Team Worker, Completer-Finisher and Implementer appear together in the second factor and Plant and Resource Investigator in the third. Finally, in the factor structure reported by Dulewicz (1995), Implementer, Completer-Finisher and Monitor Evaluator appear together, linked by a bridging/adaptive cognitive style, and Plant and Shaper appear as opposing the Team Worker role.

Team roles can, therefore, be classified as opposing two by two pairings or in two well-differentiated groups. In the two by two classifications, Plant contrasts with Team Worker or Implementer, and Shaper contrasts with Team Worker or Monitor Evaluator. Less clear are distinctions between Co-ordinator and Specialist and between Monitor Evaluator and Resource Investigator. If two clusters are proposed, then Team Worker, Implementer and Completer Finisher (and in part Monitor Evaluator) appear together, whereas Shaper and

Plant (and in some aspects Resource Investigator) appear in another cluster. The Specialist role does not have a clear theoretical association with these clusters. These theoretical and empirical comparisons are taken as supportive of the construct validity of the team role model as the empirical association between team roles and other theoretical constructs generally reveals positive evidence and role clusters support those empirical associations (see Table 2 and Table 3).

## **DISCUSSION**

Despite some negative criticism of the model we do not think it is justifiable to suggest that the “team role theory is itself flawed” (Broucek and Randell, 1996, p. 403). Even acknowledging an important limitation of the team role model, namely that Belbin did not report the theoretical foundations of his theory, its empirical formulation can be linked to a well-established role theory base. Neither is it reasonable to state that “Belbin’s study of team performance is supported by anecdote alone” (Broucek and Randell, 1996, p.403), as nine years of studying team building and effectiveness using standardised personality questionnaires and observational methodology constitute far more than just anecdotal evidence (see Dulewicz, 1995). Moreover, it is premature to conclude that the TRSPI lacks psychometric support although the less frequently used OAS is less well supported. While Furnham et al. (1993a) recognised that their results do not necessarily invalidate the model, Broucek and Randell (1996) invited researchers to avoid using the related inventories and focus on the role of personality traits in team roles and team performance.

Differences in the interpretation of effect sizes are evident in the literature. For example, similar results (a correlation of .30) have been interpreted as providing a lack of support for convergent validity (Broucek and Randell, 1996, p.396), while others have considered such values as indicators of convergent validity (Beck et al., 1999; Lessem and Baruch, 2000). This inconsistency has led to mixed claims about validity. We suggest that when non-experimental designs are used, statistical results should take into account average meta-analysis values to conclude whether an effect size is acceptable or not because, as Cohen (1988) observed, effect sizes should be interpreted considering the knowledge field of the research. Correlation values, strictly speaking, can be considered as effect sizes and we computed the average and standard deviation of correlations from psychometric and empirical studies. We followed the common rule of  $\pm 1$  standard deviation to establish low, medium and high effect sizes. Based on correlations extracted from the literature reviewed here, we suggest that for psychometric studies and for studies contrasting the team role model with other team role measures (OAS, normative vs. ipsative tests, personality measures vs. TRSPI) values below .20 can be considered low, between .20 and .34 medium, and above .34 high. On the other hand, for empirical studies, (i.e. those that correlate team roles with other theoretical constructs) average effect sizes suggest that correlations below .21 can be considered low, between .21 and .45 medium, and above .45 high. Taking this position, a correlation of .30 should not be considered as an evidence of lack of support for convergent validity.

Having reviewed psychometric studies it is clear that neither the 8-role nor the 9-role version of the TRSPI has unequivocal psychometric support and most of the studies show low or at best average effect sizes indicating only partial psychometric support. However, concerns about reliability identified in initial studies have been challenged by more recent studies using large samples of management team members. In some cases, normative statistical procedures have been used on highly ipsative data (Furnham et al., 1993a) and small or inappropriate samples have been used (Rushmer, 1996; Sommerville and Dalziel, 1998) which increases the likelihood of committing Type I and Type II errors. Future research should benefit from psychometric analysis conducted with large samples of managers, especially for the OAS on which little evidence is published. Such studies could usefully control for the types of organisation studied and the management level of participants.

Given that the model contains nine roles we would have expected stronger evidence for the existence of nine distinct roles and yet this is one psychometric property that neither the TRSPI nor personality measures have satisfied. The nine team roles cannot be clearly differentiated from each other. When empirical evidence was cross-referenced with factorial structures comprehensible dimensions appeared. These results showed the possibility of creating new groupings that may better discriminate between team roles, for example, opposing two by two pairings: Plant vs. Team Worker or Implementer, and, Shaper vs. Team Worker or Monitor Evaluator. Alternatively, two groups can be put forward: Team Worker, Implementer and Completer Finisher (and in part Monitor Evaluator), and Shaper and Plant (and in some aspects Resource Investigator). In this sense, Fisher et al. (2001) also proposed five pairings which fitted with NEO-PI-R five factor model.

The dynamic configuration of team roles measured by the TRSPI and the relative stability of traits measured by personality questionnaires leads to the conclusion that traits measured by the latter are different from those measured by the TRSPI. Thus, both instruments may be tapping different but complementary constructs. Even so, and although factor structures of both the TRSPI and the 16PF have little in common, it is reasonable to use personality questionnaires to derive team roles. It is worth remembering that Belbin identified managers who fulfil similar functions as sharing similar personality and ability characteristics, which were translated into equations based upon 16PF factors which defined team roles (Belbin and Life, 1983). If revisions are made to the TRSPI then it could benefit from stronger methodological support from personality dimensions and from evidence for the predictive power of personality theories which might help to develop a measure that can more clearly differentiate one team role from another.

As we have shown, most of the studies regarding the empirical evidence have shown average or high size effects and this leads us to conclude that the team role model has acceptable convergent validity. Factor structures for the TRSPI are coherent in its ipsative and normative forms as well as with personality measures. From this perspective we suggest that there is substantial evidence for the construct validity of the model. Therefore, the model is useful for measuring individual preferences towards contributing and

interacting with other team members. High performing teams are those defined by team member complementarity and real interaction (rather than addition). Identifying individual preferences and matching those preferences to the functions performed in a team allows team members to make useful and valuable contributions towards the team's goals and to other team members. Individual contributions supplement the contributions of other team members thus engendering real interaction and higher levels of team performance.

Since the model allows the combination of self-perception with the perceptions of others, these perceptions can be contrasted. This technique provides insights into how others are perceived which opens prospective new areas for discussion among team members. As team roles are defined through interactions with others, the discussion can embrace the tasks performed as well as the emotions that arise in the interactions that occur. When task and emotional process are jointly considered in a team it should become easier to solve problems and ensure healthy work team development.

In sum, the practical implications of the model for the measurement of team roles are substantial. As previously mentioned, two clear examples are those concerning conflict in a team and the styles of creative thinking. For example, when conflict in a team threatens to hinder progress, those team role preferences related to integrating and collaborating behaviour should come into play (Aritzeta et al., in press). In relation to team roles and cognitive styles (Aritzeta, et al., 2005; Fisher, Hunter and Macrosson 1998) interesting applications are also evident. For example, an innovative style (see definition above) is needed in any organization that is to survive. Consequently, continuous organizational change (Weick and Quinn, 1999) is better suited to a higher proportion of team roles associated with the innovative style in management teams. The more that organizational change is episodic, in terms of Weick and Quinn, the more suited it is to team roles that are related to adaptive cognitive style in a management team. From a broader point of view, it has been suggested that people with team roles displaying an adaptive style will more easily work in clan and hierarchical cultures, while people with innovative team roles will feel comfortable in market and adhocracy cultures (Cameron and Quinn, 1999).

Challenging future research opportunities have been proposed throughout this review. Aritzeta and Ayestaran (2003) and Park and Bang (2000) indicate that team role balance could be moderated by the gender composition of teams. In this regard, future research should focus on how gender composition may affect interpersonal adjustment within teams which may help the team to be balanced in terms of the number of natural roles present with implications for overall team performance. Recently, Hales (2005) has argued that in times of radical organizational change, where a common performance orientation exists, the first line manager's role remains part of a hierarchical system of individual managerial responsibility. In this sense, future research could also focus on those team role preferences that are, together with cognitive styles and conflict management approaches, conducive to the adaptability of first line managers with a team leadership expectation and yet who experience high individual accountability.

Another area for future research concerns the putting into practice of organisational strategies by top management teams. As team role composition may relate to organizational structure (Jarzabkowski and Wilson, 2002) and the nature and characteristics of these patterns can be related to how strategy is put into practice, to understand how strategy is practised future research needs to focus on how patterns of action are associated with the characteristics of both the team role composition and the wider organization. Researchers have argued that top management team changes are an important force triggering change at declining firms. However, there is little systematic evidence that replacing top managers leads to substantial organizational change at declining firms (Barker, Patterson and Mueller, 2001). Future research should focus on how team role composition affects top management team replacement and which particular team role configuration fits best with the existing organizational-level forces emanating from culture and structure.

A further area of research concerns the assessment of team performance itself. While objective criteria can be used for this purpose they represent only the outcomes of team functioning and they are not always available. A more general measure that assesses the state of team processes and team functioning would assist researchers seeking to explore this domain more widely.

Some limitations of the present study need comment. Although we systematically searched databases to find articles of interest (Ebsco, Emerald, Ingenta, Current Contents, Eric, Ovid, Psycinfo, ScienceDirect), some relevant articles and dissertations may have been overlooked. This review did not follow a meta-analysis technique because the research covers different themes and the number of empirical papers dealing with a particular discrete dependent variable is small. As team role research expands, meta-analytical techniques will be more suitable to explore the association between team roles, cognitive styles and conflict management behaviour. A model that combines these two constructs with team roles will be valuable in helping to build high performing teams.

## **CONCLUSIONS**

The dominant psychological approach to understanding teamworking needs to be complemented by socio-technical considerations. Better understanding of phenomena is more likely to occur when findings from differing perspectives are integrated. Psychological approaches require robust measurement instruments and this paper moves forward our understanding in the important area of team role assessment.

The team role model is used on an international scale and this review will be useful for managers, consultants and trainers engaged in team building processes. From an organizational perspective, since team roles appear differentially related to leadership styles and to change processes in organizations, organizations emphasising continuous change (Weick and Quinn, 1999) may be better led by managers displaying the innovative



characteristics of Plant, Shaper and Resource Investigator team roles. We recognise of course that many other factors must be considered.

The integrative view offered of team roles related to other constructs (see Table 3) should help to develop more robust and rigorous methods for determining the structure and composition of team working, as well as to better understand team dynamics. The review will help practitioners to design organizational interventions and to determine how the model can be applied to aspects of a team environment. The ways in which an individual interacts with other team members can be now associated with cognitive style, conflict managing behaviour, power and control or Machiavellian behaviour and this will help to solve problems inside the team and therefore to create effective teamworking, team building, recruitment activities and team training. As Prichard and Stanton (1999, p. 664) underlined, "If teams are to be formed on the basis of team role profiles, then the dynamics of the interaction of these roles with the environment, the task and experience need to be better understood". We hope this review has helped to achieve such a goal.

## REFERENCES

- Anderson, N. and Sleaf, S. (2004) An Evaluation of Gender Differences on the Belbin Team Role Self-Perception Inventory. *Journal of Occupational and Organizational Psychology* 77, 429–37
- Aritzeta, A. and Ayestaran, S. (2003) Aplicabilidad de la teoría de roles de equipo de Belbin: un estudio longitudinal comparativo con equipos de trabajo [Applicability of Belbin's Team Roles Theory: A Longitudinal and Comparative Study with Work Teams]. *Revista de Psicología General y Aplicada [Journal of General and Applied Psychology]* 56, (1) 61–75
- Aritzeta, A., Ayestaran, S. and Swailes, S. (in press) Team Role Preference and Conflict Management Behaviour. *International Journal of Conflict Management*.
- Aritzeta, A., Senior, B. and Swailes, S. (2005) Team Role Preference and Cognitive Styles: A Convergent Validity Study. *Small Group Research* 36, (4) 404-36
- Arroba, T. and Wedgwood-Oppenheim, F. (1994) Do Senior Managers Differ in the Public and Private Sectors? *Journal of Managerial Psychology* 9, (1) 13–16
- Balderson, S. J., and Broderick, A. J. (1996). Behaviour in Teams: Exploring Occupational and Gender Differences. *Journal of Managerial Psychology* 11, (5) 33–42
- Bales, R.F. (1950) *Interaction Process Analysis; A Method for the Study of Small Groups*. Cambridge, Mass: Addison-Wesley
- Bales, R.F. and Slater, P.E. (1955) Role Differentiation in Small Decision-making Groups. In T. Parsons and R.F. Bales (eds.) *Family, Socialization and Interaction Process* (pp. 259–306). New York: Free Press
- Barker, V.L., Patterson, P.W. and Mueller, G.C. (2001) Organizational Causes and Strategic Consequences of the Extent of Top Management Team Replacement During Turnaround Attempts. *Journal of Management Studies* 38, (2) 235-70
- Baron, H. (1996) Strengths and Limitations of Ipsative Measurement. *Journal of Occupational and Organizational Psychology* 69, 49–56
- Beck, D., Fisch, R. and Bergander, W. (1999) Functional Roles in Work Groups - An Empirical Approach to the Study of Group Role Diversity. *Psychologische Beiträge* 41, 288–307
- Belbin Associates. (1988) *Interplace: Matching People through Jobs*. Cambridge: Belbin Associates
- Belbin, M. (1981) *Management Teams, Why they Succeed or Fail*. London: Heinemann
- Belbin, M. (1993a) *Team Roles at Work*. Oxford: Butterworth-Heinemann
- Belbin, M. (1993b) A Reply to the Belbin Team-Role Self-Perception Inventory by Furnham, Steele and Pendleton. *Journal of Occupational and Organizational Psychology* 66, 259–60
- Belbin, M., Aston, R. and Mottram, D. (1976) Building Effective Management Teams. *Journal of General Management* 3, (3) 23–29

- Belbin, R.M. and Life, E.A. (1983) Management Development for the Management Team. In B. Taylor and G. Lippett (eds.) *Handbook for Management Development and Training*. London: McGraw-Hill
- Benne, K.D. and Sheats, P. (1948) Functional roles of group members. *Journal of Social Issues* 4, 41–50
- Biddle, B. (1979) *Role Theory: Expectations, Identities and Behaviors*. New York: Academic Press
- Broomfield, D. and Bligh, J. (1997) Curriculum Change: The Importance of Team Role. *Medical Education* 31, 109–14
- Broucek, W.G. and Randell, G. (1996) An Assessment of the Construct Validity of the Belbin Self-Perception Inventory and Observer's Assessment from the Perspective of the Five-factor Model. *Journal of Occupational and Organizational Psychology* 69, 389–405
- Cameron, K.M. and Quinn, R.E. (1999) *Diagnosing and Changing Organizational Culture. Based on the Competing Values Framework*. Reading, Mass: Addison-Wesley.
- Cattell, R.B., Eber, H.W. and Tatsuoka, M.M. (1970) *The Handbook for the Sixteen Personality Factor Questionnaire*. Champaign, IL: Institute for Personality and Ability Testing
- Cohen, J. (1988) *Statistical Power Analysis for the Behavioral Sciences*. (2<sup>a</sup> ed.) Hillsdale, NJ: Lawrence Erlbaum Associates
- Costa, P.T. and McCrae, R.R. (1992) *Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO-FFI) Professional Manual*. Odessa, FL: Psychological Assessment Resources
- Davis, J., Millburn, P., Murphy, T. and Woodhouse, M. (1992) *Successful Team Building: How to Create Teams that Really Work*. London: Kogan Page
- Dulewicz, V. (1995) A Validation of Belbin's Team Roles from 16PF and OPQ using Bosses' Ratings of Competence. *Journal of Occupational and Organizational Psychology* 68, 81–99
- Dulewicz, V. and Higgs, M. (1999) Can Emotional Intelligence be Measured and Developed? *Leadership and Organization Development Journal* 20, (5) 242–52
- Fisher, S.G., Hunter, T.A. and Macrosson, W.D.K. (1998) The Structure of Belbin's Team Roles. *Journal of Organizational and Occupational Psychology* 71, 283–88
- Fisher, S.G., Hunter, T.A. and Macrosson, W.D.K. (2001) A Validation Study of Belbin's Team Roles. *European Journal of Work and Organizational Psychology* 10, (2) 121–44
- Fisher, S.G., Hunter, T.A. and Macrosson, W.D. (2002) Belbin's Team Role Theory: For Non-managers Also? *Journal of Managerial Psychology* 17, (1) 14–20
- Fisher, S.G., Macrosson, W.D. and Semple, J.H. (2001) Control and Belbin's Team Roles. *Personnel Review* 30, (5) 578–88
- Fisher, S.G. and Macrosson, W.D.K. (1995) Early Influences on Management Team Roles. *Journal of Managerial Psychology* 10, (7) 8–15

- Fisher, S.G., Macrosson, W.D. and Sharp, G. (1996) Further Evidence Concerning the Belbin Team Role Self-perception Inventory. *Personnel Review* 25, (2) 61–67
- Fisher, S.G., Macrosson, W.D.K. and Wong, J. (1998) Cognitive Style and Team Role Preference. *Journal of Managerial Psychology* 13, (8) 544–57
- Furnham, A., Steele, H. and Pendleton, D. (1993a) A Psychometric Assessment of the Belbin Team-Role Self-Perception Inventory. *Journal of Occupational and Organizational Psychology* 66, 245–57
- Furnham, A., Steele, H. and Pendleton, D. (1993b) A Response to Dr Belbin's Reply. *Journal of Occupational and Organizational Psychology* 66, 261
- Graen, G.B. (1976) Role Making Processes within Complex Organizations. In M.D. Dunnette (ed.) *Handbook of Industrial and Organizational Psychology* (pp. 1201–45) Chicago: Rand McNally
- Graen, G.B. and Scandura, T.A. (1987) Toward a Psychology of Dyadic Organizing. *Research in Organizational Behavior* 9, 175–208
- Hales, C. (2005) Rooted in Supervision, Branching into Management: Continuity and Change in the Role of First-Line Manager. *Journal of Management Studies* 42, (3) 471–506
- Henry, S. and Stevens, T. (1999) Using Belbin's Leadership Role to Improve Team Effectiveness: An Empirical Investigation. *Journal of Systems and Software* 44, (3) 241–50
- Holland, J.L. (1985) *Making Vocational Choices: A Theory of Vocational Personalities and Work Environments*. New Jersey: Prentice-Hall
- Ilgel, D.R. and Hollenbeck, J.R. (1991) The Structure of Work: Job Design and Roles. In M.D. Dunnette and L.M. Hough (eds.) *Handbook of Industrial and Organizational Psychology* (Vol. 3, pp. 165–207). Palo Alto: Consulting Psychology Press
- Jackson, C. (2002) Predicting Team Performance from a Learning Process Model. *Journal of Managerial Psychology* 17, (1) 6–13
- Jarzabkowski, P. and Wilson, D.C. (2002) Top Teams and Strategy in a UK University. *Journal of Management Studies* 39, (3) 355–81
- Katz, D. and Kahn, R.L. (1978) *The Social Psychology of Organizations*. (2nd ed.) New York: John Wiley and Sons
- Kirton, M.J. (1989) *Adaptors and Innovators: Styles of Creativity and Problem Solving*. London: Routledge
- Lawrence, S. (1974) The Team Road to Success. *Personnel Management*, (June) 28–32
- Lessem, R. and Baruch, Y. (2000) Testing the SMT and Belbin Inventories in Top Management Teams. *Leadership and Organization Development Journal* 21, (2) 75–83
- Linton, R. (1945) *The Cultural Background of Personality*. New York: Appleton Century
- LoBue, R. (2002) Team Self-assessment: Problem Solving for Small Workgroups. *Journal of Workplace Learning* 14, (7) 286–97
- Loveday, D. (1984) Factors Affecting the Management of Interdisciplinary Research in the Pharmaceutical Industry. *RandD Management* 14, (2) 93–103

- Mabey, B. and Hunter, R. (1986) Using Personality Measures to Improve Selection. *Guidance and Assessment Review* 2, (5) 1–4
- Macrosson, W.D. and Hemphill, D.J. (2001) Machiavellianism in Belbin Team Roles. *Journal of Managerial Psychology* 16, (5) 355–63
- Margerison, C. and McCann, D. (1990) *Team Management*. London: W.H. Allen
- McCrimmon, M. (1995) Teams without Roles: Empowering Teams for Greater Creativity. *Journal of Management Development* 14, (6) 35–41
- Meade, A.W. (2004). Psychometric Problems and Issues Involved with Creating and using Ipsative Measures for Selection. *Journal of Occupational and Organizational Psychology* 77, 531-552
- O'Doherty, D.M. (2005) Working as Part of Balanced Team. *International Journal of Engineering Education* 21, (1) 113–120
- Park, W.-W. and Bang, H. (2000) Team Role Balance and Team Performance. *Paper presented at the Biannual Conference on Belbin's Team Roles*
- Parker, G.M. (1990) *Team Players and Teamwork: The New Competitive Business Strategy*. Oxford: Jossey-Bass.
- Partington, D. and Harris, H. (1999) Team Role Balance and Team Performance: An Empirical Study. *Journal of Management Development* 18, (8) 694–701
- Prichard, J.S. and Stanton, N.A. (1999) Testing Belbin's Team Role Theory of Effective Groups. *Journal of Management Development* 18, (8) 652–65
- Reoyo, A., Lopez, R. and Lucha, V. (2005) *Meredith Belbin Team Roles and Modes of Conflict Behaviour: A Study in Work Teams from Basque Country Organizations*. Poster presented at the Annual Conference of the International Association for Conflict Management (IACM), Seville, Spain
- Rushmer, R. (1996) Is Belbin's Shaper Really TMS's Thruster-organizer? An Empirical Investigation into the Correspondence between the Belbin and TMS Team Role Models. *Leadership and Organization Development Journal* 17, (1) 20–26
- Saville, P., Holdsworth, R., Nyfield, G., Cramp, L. and Mabey, W. (1992) *Occupation Personality Questionnaire Manual*. Esher: SHL
- Saville, P. and Wilson, E. (1991) The Reliability and Validity of Normative and Ipsative Approaches in the Measurement of Personality. *Journal of Occupational Psychology* 64, (3) 219–238
- Senior, B. (1997) Team Roles and Team Performance: Is There 'Really' a Link? *Journal of Occupational and Organizational Psychology* 70, 241–58
- Senior, B. (1998) An Empirically-based Assessment of Belbin's Team Roles. *Human Resource Management Journal* 8, (3) 54–60
- Senior, B. and Swailes, S. (1998) A Comparison of the Belbin Self Perception Inventory and Observer's Assessment Sheet as Measures of an Individual's Team Roles. *International Journal of Selection and Assessment* 6, (1) 1–8

- Senior, B. and Swailes, S. (2004) The Dimensions of Management Team Performance: A Repertory Grid Study. *The International Journal of Productivity and Performance Management* 53, (4) 317–33
- Shi, Y. and Tang, H.K. (1997) Team Roles Behaviour and Task Environment: An Exploratory Study of Five Organizations and their Managers. *Journal of Managerial Psychology* 12, (2) 88–94
- Sommerville, J. and Dalziel, S. (1998) Project Teambuilding: The Applicability of Belbin's Team-role Self-perception Inventory. *International Journal of Project Management* 16, (3) 165–171
- Spencer, J. and Pruss, A. (1992) *Managing your Team*. London: Piatkus
- Stewart, V. and Stewart, A. (1981) *Business Applications of Repertory Grid*. London: McGraw-Hill
- Swailes, S. and McIntyre-Bhatty, T. (2002) The "Belbin" Team Role Inventory: Reinterpreting Reliability Estimates. *Journal of Managerial Psychology* 17, (6) 529–36
- Swailes, S. and McIntyre-Bhatty, T. (2003) Scale Structure of the Team Role Self Perception Inventory. *Journal of Occupational and Organizational Psychology* 76, 525–529
- Torrington, D., Weightman, J. and Johns, K. (1985) *Management Methods*. London: Personnel Management, Ins
- Watkins, B. and Gibson-Sweet, M. (1997) Sailing with Belbin. *Education + Training* 39, (3) 105–110
- Weick, K.E. and Quinn, R.E. (1999) Organizational Change and Development. *Annual Review of Psychology* 50, 361–386
- Woodcock, M. (1989) *Team Development Manual*. (2nd ed.) Brookfield, VT: Gower

## **APPENDIX 1. Summary of TRSPI-9R and OAS Scoring**

The 9-role TRSPI contains seven sections each containing ten statements (items). Each section contains one item per team role plus one item to measure social desirability. Items in one section are independent of items in other sections. A sample item is, 'I can work well with a very wide range of people'. Respondents are asked to distribute ten points between the ten items in each section according to the strength of their belief that the items most accurately reflect their behaviour. Thus, at extremes, ten points could be given to one item or one point to each of ten items. Usually, two to four items are scored.

The scoring of each scale (team role) is achieved by summing the points awarded to each of the relevant seven items. The total raw score achieved in the TRSPI-9R is always 70 and hence it is an ipsative measure overall. Since the items are dispersed throughout sections such that there is one item for each role in each section, the scores given to items for any team role are not fully ipsative as they do not sum to a constant value. However, while the scores for items in the same scale are independent of each other, they are partly dependent on the scores given to other scales. Thus, the TRSPI is ipsative within its sections (since scores always sum to 10), but not between its sections.

The OAS is used by co-workers who know an individual well. It is a 72 item peer-rater checklist divided into two parts. Part 1 contains 45 positive adjectives which are possible descriptors of the individual being observed. Part 2 contains 27 negative adjectives or phrases. Observers select the words or phrases that they think describe the individual. Each team role is scored with five positive and three negative adjectives. The OAS produces a ranking of team roles for each individual observed.

## APPENDIX 2: Review of Statistical and Theoretical Evidence on Belbin's Team Role Theory and Inventories

Author(s)	Purpose*	Aims, Instruments and sample	Main results	Main conclusions	Stance
1. Anderson and Sleep (2004)	(b)	Analyze gender differences among team roles and potential adverse impact of Belbin's original TRSPI-8R on selection and team building activities. (311 sales and customer employees, 208 females and 103 males).	Men scored higher on Shaper, Plant and Monitor Evaluator and women on Team Worker. Rank orders differed between men (22% rated Chair as primary role) and women (41% rated Team Worker as primary role).	Concerns raised in relation to the potential adverse impact of the TRSPI-8R for selection and team building as it seems to favour males on leadership roles (Chair and Shaper).	-
2. Aritzeta and Ayestaran (2003)	(b)	Pre-test/post-test study. Analysis of a) team role balance and team performance, b) role clarity, c) team development stages and required team roles. TRSPI-9R. (241 students forming 40 teams)	Balanced teams at time 1 and 2 showed higher levels of team performance. Avoided roles and natural team roles increased at time 2.	Team role balanced hypothesis is supported. Team role clarity occurred after 4 months of teamworking. Appropriate team roles do not dominate at the initial or at the final stage of team existence.	+
3. Aritzeta, Ayestaran and Swailes (in press)	(b)	To analyse the association between team role preferences and conflict managing behaviour. TRSPI-9R and Rahim ROCI-II questionnaire. (202 students)	30 out of 45 predictions were correctly hypothesized showing a mean correlation of ( $\bar{M}$ : .15) at time 1 and ( $\bar{M}$ : .19) at time 2.	The Team Role Model is supported with conflict managing styles theory. As time goes by an increase in the role clarity is observed which affects the association between team roles and conflict managing styles.	+
4. Aritzeta, Senior, and Swailes (2005)	(b)	To observe the association between team roles and cognitive styles. TRSPI-9R and Kirton Adaptor-Innovator Inventory-KAI. (109 managers and 114 students)	21 out of 27 subscale correlations were supported for managers ( $\bar{M}$ : .26) and 17 out of 27 for students ( $\bar{M}$ : .21). All total scores correlations were supported for managers ( $\bar{M}$ : .28) and 8 out of 9 for students ( $\bar{M}$ : .31).	The team role model is fully supported with the adaptor-innovator cognitive styles. Fisher, Macrosson and Wong (1998) probably miscalculated KAI subscale scoring.	+
5. Arroba and Wedgwood-Oppenheim (1994)	(b)	Team role preferences between senior managers in public and private sector. TRSPI-8R. (157 public sector managers and 78 private sector managers)	Rank orders of team roles were similar in both samples. Local government managers scored higher on Implementer and Shaper and private sectors managers score higher on Plant and Team Worker roles.	Claims that different organisation cultures differentially attract role preferences and that the TRSPI is useful to analyse them.	+
6. Balderson and Broderick (1996)	(b)	Compare clusters of team role preferences of a) health sector vs. non health sector managers; b) women vs. men and c) senior doctors vs. managers. TRSPI-9R. (185 managers and doctors)	Team roles did not differ between health sector vs non health sector managers, however, differences between doctors and managers were observed. Differences on sex are observed only for ME and PL (both higher for women).	Poor discriminant validity is claimed for team roles and team role clusters, although some differences in team role preferences are observed.	+/-
7. Beck, Fisch, and Bergander (1999)	(a)	Analyze the structure of the TRSPI-9R with the System for the Multiple Observation of Groups. Reliability and exploratory factor analysis in three different samples. (308 private sector managers, 156 public sector managers and 176 students: 640 individuals)	The SYMLOG analysis reports that 45 out 70 items of the TRSPI are identified as task-oriented: 29 items as influence-seeking behaviour and only 10 items as person-oriented. Reliability ranged from .11 to .59 ( $\bar{M}$ : .41). Confirmatory factor analysis shows four theoretical consistent bipolar factors. Differences between samples are observed for team role preferences and team role factor structures.	The team role model is mainly focused on task-oriented behaviour and socio-emotional aspects are of secondary importance. SYMLOG analysis reports interesting lines for future research. The TRSPI-9R shows poor reliability but consistent factor structure.	+/-
8. Belbin, Aston, and Mottram (1976)	(b-c)	Study the efficiency of management teams analyzing team composition. 16PF, Test of Critical Thinking, Personal Preference Questionnaire, Bales observers' group interactive records. (Sample not specified)	There is a positive association between predicted and actual results in the Executive Management Exercise, though no specific results are reported.	Claims that management teams with good team role balance were more effective. Five principles for team integration are proposed.	+
9. Broomfield and Bligh (1997)	(b)	Analyze the predominance of team roles in members of a medical faculty curriculum development team. TRSPI-8R (25 faculty members)	Dominance of Shapers and Implementers was observed. Differences by age were also reported.	The TRSPI is viewed as a useful instrument to compose balanced teams.	+



## Appendix 2: continued

10. Broucek and Randell (1996)	(a)	Normative and ipsative comparisons of TRSPI and OAS. Correlational structure of TRSPI and OAS against personality measure of NEO-PI-(R). Studies: 1) Ipsative TRSPI-9R and OAS (152 practicing managers) 2) Normative TRSPI-9R and self ratings of OAS (123 Business students) 3) Ipsative TRSPI-9R and NEO-PI (83 practicing managers and students) 4) Normative TRSPI-9R and NEO-PI-R (138 business students) 5) Self rated OAS and NEO-PI-R (sample as study 2)	<u>Results by studies:</u> 1) Alphas for TRSPI-9R ranged from .25 to .52 ( $\bar{M}$ : .43) and for OAS from .29 to .82 ( $\bar{M}$ : .57). Convergent correlations were reported for 8 out of 9 team roles ( $\bar{M}$ : .27; $p < .05$ ). 2) Convergent self rating correlations for 8 out of 9 team roles ( $\bar{M}$ : .42, $p < .001$ ). 3) 8 out of 19 correlations correctly hypothesised ( $\bar{M}$ : .19). 4) 14 out of 19 correlations correctly hypothesised ( $\bar{M}$ : .24). 5) 12 out of 19 correlations correctly hypothesised ( $\bar{M}$ : .25).	Low convergent correlations and poor discriminant validity between TRSPI and OAS do not support them as parallel forms. Construct validity of TRSPI-9R with NEO-PI is not supported. Ipsativity of TRSPI-9R shows distorting effects. OAS fails to show construct validity with NEO-PI-R.	-
11. Dulewicz and Higgs (1999)	(b)	Develop a new questionnaire to measure Emotional Intelligence (EI), analyse its construct validity with the team role model, EIQ and Cattell's 16PF. (201 managers)	Those high in EI are likely to show higher scores on CO and RI and lower scores on SH and CF roles. Average correlation between team roles and EI subscale is .16; with the total EI is .21.	Partial construct validity of the EI instrument is supported using the team role model, with exceptions of conscientiousness and integrity subscales.	+
12. Dulewicz (1995)	(a)	Inter-method reliability and concurrent validity of 8 team roles derived from 16PF and OPQ. Cattell's 16PF, Occupational Personality Questionnaire concept 5 and Job Competences Survey. (100 managers)	17 out of 28 pairs of correlations for 16PF and 20 for OPQ were significant. Seven out of eight team roles correlated above .27 ( $\bar{M}$ : .37). Multiple correlation between supra-competences and team roles are significant in all team roles ( $\bar{M}$ : .40)	Correlational support for classifying 8 team roles into four pairs, though factor structure did not match Belbin's (1981) proposal. Inter-method/equivalent form reliability and construct validity is supported for all team roles except for Monitor Evaluator. Team roles are independent from measures of salary and job responsibility. Concurrent validity with supra-competences is reported.	+/-
13. Fisher and Macrosson (1995)	(b)	Effects of childhood family environment on team roles. Cattell's 16PF and Moos' Family Environmental Scale. (199 students)	Correlation between both scales ranged from .2 to .3. Multiple regression analysis showed that Moos scales predicted team roles.	Family environment is seen as a partial determinant of team roles.	+
14. Fisher, Hunter, and Macrosson (2001)	(a)	Convergent and discriminant validity using multitrait-multimethod matrix and confirmatory factor analysis. 1) Cattell's 16PF-5, 2) Video observation with Belbin behavioural checklist and 3) Occupational Personality Questionnaire. (338 managers forming 55 teams)	All correlations in validity diagonals are significant ( $d1 \bar{M}$ : .48; $d2 \bar{M}$ : .49; $d3 \bar{M}$ : .49). 161 out of 168 off-diagonal values are smaller than values in the diagonals and only 17 out of 168 correlations were higher in the sub-matrices. Model fit was found after pairing 6 team roles. Direct correspondence with the NEO-PI-R Big Five dimensions was observed.	Convergent validity is supported for the team role model. Overall discriminant validity is supported, though trait assessment does not appear to be independent from the method of assessment. Confirmatory factor analysis did not confirm convergent and discriminant validity and data could not support 8 team roles. Problems of overlapping definitions of team roles are claimed.	+/-
15. Fisher, Hunter, and Macrosson (2002)	(b)	Applicability of the team roles model for management and non-management teams. Analysis of performance related to team role composition. Cattell's 16PF. (178 managers and 160 non-managers)	Team role frequency in both team types was not different. Team performance for management teams and non-management teams was not different.	Belbin's team role theory is applicable to non-managerial teams.	+
16. Fisher, Hurter, and Macrosson (1998)	(a)	Analyze the structure of team roles and secondary team roles using Cattell's 16PF. (1,441 managers)	Multidimensional scaling showed three-dimensional model with two major groupings.	Team roles could be grouped in task and relationship types. Three of the four pairings proposed by Belbin are reached.	+

## Appendix 2: continued

17. Fisher, Macrosson, and Semple (2001)	(b)	Observe if power and control operate in Belbin team roles. Cattell's 16PF4 and Schutz's FIRO-B. (336 students and employees)	6 out of 8 predictions were supported. Team roles show different levels of control wanted and expressed.	Construct validity of the Belbin team role model is supported, though his 4x2 typology was not replicated from the control expressed and control wanted point of view.	+
18. Fisher, Macrosson, and Sharp (1996)	(a)	Pretest-posttest study. Observe how well team roles match using TRSPI-8R and Cattell's 16PF. (192 students)	TRSPI-8R test-retest reliability ranged from .17 to .64 ( $\bar{M}$ : .36) and team role test-retest reliability ranged from .24 to .68 ( $\bar{M}$ : .45). Correlations between 16 PF and TRSPI-8R were significant for 6 team roles ( $\bar{M}$ : .16).	The TRSPI-8R shows lack of stability in seven roles. Test-retest reliability is not supported for TRSPI-8R. Constructs tapped by 16PF and TRSPI-8R might be different. Supports conclusions of Furnham et al (1993a).	-
19. Fisher, Macrosson, and Wong (1998)	(b)	Observe the association between team roles, cognitive styles and extraversion. Cattell's 16PF and Kirton Adaptor-Innovator Inventory-KAI. (183 students)	8 out of 24 KAI subscale predictions were correctly hypothesised ( $\bar{M}$ : .16), however total scores correlations were correct only for 5 out 8 ( $\bar{M}$ : .21). Only 3 out 8 correlations were supported for extroversion ( $\bar{M}$ : .34)	Partial support for the Belbin team role model is claimed.	+/-
20. Furnham, Steele, and Pendleton (1993a)	(a)	Psychometric analysis of Normative (Likert scale) and ipsative versions of TRSPI. 1) Normative TRSPI-8R (102 Students and employees) 2) Normative TRSPI-9R (110 Students and employees) 3) Ipsative TRSPI-8R (100 Employees)	<u>Results by studies:</u> 1) Alpha range from .34 to .71 ( $\bar{M}$ : .53). 2) Alpha range from .34 to .77 ( $\bar{M}$ : .58). 3) Alpha range from .33 to .71 ( $\bar{M}$ : .46).	Low reliability, poor discriminant validity and unexpected factor structures in both normative TRSPI 8 and 9 role versions and for the ipsative TRSPI-8 role version are observed.	-
21. Henry and Stevens (1999)	(b)	Analyze team role composition in terms of leadership roles. TRSPI-8R. (24 students in 8 teams)	Teams with a single team role leader perform better than those teams with no leader team role or with multiple leaders.	Team role balance hypothesis is supported. Belbin's model can be useful to compose teams with proper balance of leader roles.	+
22. Jackson (2002)	(b)	To explore if the TRSPI-9R predicts team performance compared to the Learning Styles Questionnaire . (182 employees, 89 male and 93 female).	17 out of 18 team comparisons predicted team performance using LSQ. Only 4 out of 18 comparisons were significant using TRSPI-8R.	Team performance is predicted from the balance of different learning processes in a team. States that Belbin's model has weak theoretical basis as a team process model.	-
23. Lawrence (1974)	(c)	Description of Belbin's early work at Henley and explanation of how his theory is applied to top management teams.		Belbin model emphasizes the fit between new candidates' characteristics and actual team composition.	+
24. Lessem and Baruch (2000)	(b)	Identify attributes of top management teams and observe the correspondence between their managerial styles and team role preferences. TRSPI-9R and Spectral Managerial Inventory. (Selection of 54 managers from 22 Top Management Teams)	"Change managers" and "developmental managers" predominate in management types. CO, SH and PL predominate in team roles. 23 out of 72 correlations are statistically significant ( $\bar{M}$ : .24).	Coherent patterns of association are shown between management styles and team role preference. Belbin team role model's convergent valid is partially supported.	+
25. LoBue (2002)	(c)	Theoretical association between the "Team Self-Assessment" (TSA) mechanism for the management success and "control self-assessment", "team climate" and "team roles" constructs.	Roles of trainer, expert, advisor and mentor of the TSA are seen to echo Belbin's team role categories of people-oriented, action-oriented and cerebral.	Using the TSA, self-reflection is increased in any organizational unit making incremental improvements in the short and long term. Belbin's team role model can help to do so.	+
26. Loveday (1984)	(c)	Analyze of factors affecting highly effective management of R & D in the Pharmaceutical sector.		Among internal factors the extent of fulfilment of Belbin's team roles is related with R&D management.	+

## Appendix 2: continued

27. Mabey and Hunter (1986)	(b)	Analyze how personality measures and team role may be combined to improve selection procedures. Explore the association between team roles and leadership styles. OPQ and Bass leadership descriptions. (527 professionals and managers).	Poor discrimination between measures of team roles and leader/subordinate relations is reduced by omitting redundant traits from equations.	New equations developed to analyse team role preference as well as leader/subordinate roles using the OPQ.	?
28. Macrosson and Hemphill (2001)	(b)	Analysis of the Machiavellianism component in Belbin's team roles. Cattell's 16PF and Machiavellianism IV Scale. (50 students)	Seven out of eight predicted correlations were confirmed ( $\bar{M} : .29$ ).	Construct validity of Belbin Team Role Theory is supported.	+
29. McCrimmon (1995)	(c)	Analyze Belbin's team role model in the light of organizational environment.		Belbin's theory was developed at a time when organizations were relatively static. The team role concept is static and organizations are now more dynamic. Other factors besides team composition should be explored to help organizations succeed.	-
30. O'Doherty (2005)	(b)	To determine whether the selection of teams based on the team role model would result in high performing teams. (64 students, TRSPI-9R and OAS).	Average preferred roles diverge between self perception and observers' assessment. Partial agreement was observed between predicted and actual team performance.	The team role model is seen as a positive technique for team building programmes.	+
31. Park and Bang (2000)	(b)	Evaluate team role balance with team performance and team stages. TRSPI-9R and OAS. (316 employees forming 52 teams)	Only teams considered balanced at the 90 percentile showed positive correlation with performance. Team stage of development and required team roles roughly matched.	Team role balance hypothesis in terms of "natural" team roles is not supported. Matching of team roles and stages of development is related to performance.	+/-
32. Partington and Harris (1999)	(b)	Analyze the "team role balance" hypothesis operationalised in three different ways and the differential team role contribution in different tasks. TRSPI-8R. (271 students)	None of the correlations between measures of team role balance and performance was statistically significant. No clear pattern is observed in team role contributions.	Measures of team role balance have no relationship with performance at the group level.	-
33. Prichard and Stanton (1999)	(b)	Analyze if team composition affects team performance. TRSPI-9R and Critical Reasoning Verbal Evaluation. (48 students forming 12 groups)	Teams with mixed team roles showed higher performance than teams composed only of Shapers. The latter showed less consensus, less planning proposals but more interactions.	Over-representation of Shapers in teams may impair performance. Team role balance hypothesis is supported.	+
34. Reoyo, Lopez and Lucha (2005)	(b)	Analyze if team roles are related to different modes of conflict in work teams. (175 employees forming 27 work teams, TRSPI-9R and a Team Assessment Questionnaire).	Resource Investigators were positively related to communication and Monitor Evaluators to consensus ( $\bar{M} : .22$ ). Plants negatively correlated to avoidance modes of managing conflict and Team Workers to competitive modes ( $\bar{M} : -.18$ ).	The team role model is useful in understanding teamwork dynamics in terms of the way team members approach conflict.	+
35. Rushmer (1996)	(b)	Theoretical and empirical correspondence with the Team Management System (TMS) role models. TRSPI-8R and TMS. (78 students and employees)	Inconsistent results are found in TSM team roles and the team role model.	No direct correspondence between both models found.	-
36. Senior and Swailes (1998)	(a)	Convergent validity of TRSPI and OAS. TRSPI-9R and OAS. (65 managers)	Kendall's coefficient of concordance (W) for OAS is above .60 for 35 out of 65 sets. Spearman rank correlations were significant for 5 out of 9 team roles ( $\bar{M} : .27$ ).	Poor overall inter-observer agreement is reported. Construct and convergent validities of the TRSPI-9R and OAS are seriously questioned.	-
37. Senior (1997)	(b)	Analyze if a) team performance is predicted by team role theory, and b) if certain team roles are predominant at different team development stages. TRSPI-9R, OAS and qualitative interviews. Repertory Grid Technique. (67 managers forming 11 management teams)	Key stage of activity of teams and useful team roles are partially met for 3 teams. Null associations for 2 teams and null plus partial associations for 6. Performance is related with different measures of team role balance.	Predicted and actual performance for teams is matched. Team role balance is associated with team performance. Belbin's team role theory is supported.	+

## Appendix 2: continued

38. Senior (1998)	(a)	Exploratory factor analysis of the TRSPI-9R. (352 junior and middle managers and 46 students)	Four bi-polar factors are found accounting for 69.1% of total variance.	IMP/CF appeared mixed and RI does not appear as a distinct role. Doubts over the reliability of the TRSPI are raised.	-
39. Shi and Tang (1997)	(b)	Analyze the correspondence between organizational task environment and team role preferences. TRSPI-8R. (100 managers from 5 different organizations)	20 out of 40 observed associations correctly matched predictions. Homogeneous and heterogeneous organizational contexts showed different preferences for team roles.	Construct validity of the team role theory is claimed.	+
40. Sommerville and Dalziel (1998)	(b)	1) Replicate Belbin's initial proposition of team role dimensionality; 2) Observe differences between students of different faculties and courses; 3) Analyze if the TRSPI varies between male and female students; 4) Observe the correspondence between the TRSPI and the Herrmann Brain Dominance Instrument . Normative TRSPI-9R (92 Students, 41% male and 59% female).	Factor loadings differed from those reported by Furnham et al. (1993a) and Belbin's model . Implementer and Co-ordinators predominated among men and Teamworkers among women. No significant correlation between team roles and brain dominance measures was observed.	No clear association is observed between items and team roles. There is a need to theoretically and empirically derive Belbin's model.	-
41. Swailes and McIntyre-Bhatty (2002)	(a)	New method for analyzing team role reliabilities. TRSPI-9R. (5,003 employees and managers)	Alpha of TRSPI-9R including zero values range from .23 to .66 ( $\bar{M}$ : .46). Alphas with scored items only -new alpha- range from .56 to .78 ( $\bar{M}$ : .69).	Using weighted average inter-item correlation coefficients in a formula unrelated to scale length, provides higher levels of internal consistency for team roles.	+
42. Swailes and McIntyre-Bhatty (2003)	(a)	Confirmatory factor analysis of the TRSPI-9R scale structures using scored items only. TRSPI-9R. (5,003 employees and managers)	Unidimensionality of scales is confirmed for 6 scales while 3 showed a better fit in a two dimension solution.	Support for the TRSPI-9R is provided. Suggests that CF, IMP and SH scales could benefit from item rewording.	+
43. Watkins and Gibson-Sweet (1997)	(b)	Predict team performance and team strength and weaknesses from team role composition analysis. TRSPI-8R. (7 students forming 1 work team)	Retrospective analysis shows that self-perception is far from clear in some team members. Some team members satisfy team roles alien to them. Attitudes toward teamwork change during team development stages.	The team found the model valuable in carrying out their tasks and to better understand team dynamics in relation to the team task.	+

Purpose\*: (a) Test the construct, convergent and/or discriminant validity and reliability of Belbin's team role measures.

(b) Empirically test the Team Role Model.

(c) Theoretical dissertation on the Team Role Model.

Stance: +, - and +/- represents the supportive, contradictory or mixed evidence for Belbin's team role theory and/or instruments. '?' represents no clear outcome.

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