Preferred Team Roles and Communication Patterns in Teamwork – Is There a Formula for Effectiveness? – Case Study Analysis

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Abstract. Preferred team role composition is said to influence team work effectiveness and communication patterns within teams. It is often recommended to balance team members in terms of socio-emotional and task-oriented preferred roles. However results obtained during this study indicate that there might not be such a possibility in the managerial environment. Hereby we present case studies of two extremely unbalanced teams in terms of socio-emotional and task-oriented role preference and its relationship with communication patterns in teamwork effectiveness. As suggested by literature, neither of these extremities is fully beneficial in terms of game play results. However it seems that a team consisting of only task-oriented participants performed better than purely socio-emotional oriented team. The first part of this article summarizes theoretical background and outlines the method used in this study. In the second part we present case studies of chosen unbalanced teams with in-depth analysis of their communication patterns.

Keywords: Team communication patterns · Preferred team roles
Serious games · Effectiveness

1 Introduction

Team work, team communication and effectiveness are a commonly combined and extensively researched areas in context of Business Simulation Games (BSG). Findings related to these topics come from many fields (i.e.: management, psychology, computer science, sociology, education, marketing, game-theory, etc.), and thus, BSG as a research domain, tend to be highly interdisciplinary. As a result an interdisciplinary approach is also highly recommended by scholars and practitioners of the field, especially for research methods employing serious games [1].

The majority of authors agree on the importance of the role of communication in experiential learning and serious game-based learning courses [2–7]. In fact, this consensus is reached, across all the fields related, stating communication to be central to any team actions. However, authors generally disagree on the way learning effectives is reached and measured.

This study derives from process-oriented research method for teamwork effectiveness assessment in BSG that was elaborated to take into account the dynamics of

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the game processes and encompass qualitative and quantitative measures [8]. The aforementioned method was employed to examine a group of master level business students taking part in a business simulation games course, and will be briefly introduced for the purposes of this paper. The aim of this study however, is to elaborate in greater detail on chosen inter-dependencies and processes captured by the above mentioned method.

1.1 Communication and Effectiveness in Teams in Business Simulation Games

Communication in group processes research derives from the psychological domain of group dynamics. In order to define a 'group' or a 'team' there is usually a list of their descriptive characteristics created. It is worth noting that Levi [9] particularly stresses the importance of interpersonal interactions among the group members, stating the communication to be the main and most important group process. Nevertheless, their definitions also underline direct interactions and performance, together with complementary skills of the members as teams' core qualities [10]. Thus, communicative behaviours were one of the core components of the case study analyses in this research. In addition, Barnlund's Transactional Model of Communication was used at the conceptual stage of the original study [11].

Existing studies of team work, lack sound empirical evidence around serious games effectiveness. This fact is attributed to the diversity of measures for effectiveness and communication assessment, plurality of data collection methods, and overall suboptimal study designs [12]. Several researchers point out to the necessity of further exploration of this matter, as serious games are discussed in the literature to be powerful learning tools [13–16].

It is also important to mention that the general logic and methodological approach of original study for communication effectiveness in teamwork was derived from studies in group development models, where two criteria were considered for group development models construction and analysis: (1) process- and (2) outcome-oriented [17].

1.2 Belbin's Self Perception Inventory – Team Roles and the Balance Between Socio-emotional and Task Role Preferences

Belbin defines preferred team roles as "a tendency to behave, contribute and interrelate with others in a particular way", pointing out that they are to be understood as a limited set of beneficial behaviors that bring meaningful input into the teams actions and can be divided into a few interconnected groups [18]. Each role is characterized in Appendix 1.

The questionnaire itself is being widely used in managerial practice. The main reason for that might be the fact that it addresses a literature gap regarding practice of working teams, especially in the field of balanced teams composition [19]. In this study the questionnaire was used to determine the balance of socio-emotional and task – oriented roles in researched teams.

There is ample research literature regarding relationship between team work effectiveness and Belbin team roles balance that confirms its existence [20] and lack of it [21].

Polish validation of this questionnaire, which was used for the purpose of this study is described as a valuable tool. However, its authors underline that this method should be approached as experimental, as it lacks an in-depth research of accuracy of its scales [22].

To determine whether the team is balanced or not, Fisher, Hunter and Macrosson method was used. Each members result was classified according to two categories: (a) socio-emotional or (b) task-oriented [23].

2 Method

The method of the original study was described in great detail in the authors former article, [8]. For the purpose of this paper the method will be briefly outlined to provide a point of reference.

The aim of the original research was to scrutinize team work effectiveness in context of team communicative behaviors. In this study the main focus will regard the preferred team role balance/imbalance results and combining them with communication behaviours obtained.

2.1 Socio-emotional and Task-Oriented Role Balance

First, the preferred team roles of the team members were diagnosed by Belbin's Self-Perception Inventory [24]. The results of each member were classified according to two categories: (a) socio-emotional or (b) task-oriented – using Fisher, Hunter and Macrosson method [23]. Next, the ratio of both categories was assessed as balanced or not by the rule of thumb as suggested by the authors. See Table 1 below for Belbin's role categorization.

Table 1. Preferred group role categories. Own elaboration.

Socio-emotional oriented	Task-oriented
Chairman (coordinator)	Shaper
Company worker (implementer)	Plant
Resource investigator	Monitor-evaluator
Team worker	Completer-finisher

As a result, the "profiles" of teams were obtained, indicating balance or imbalance of preferred roles.

2.2 Team Work Effectiveness Measures for Communication Behaviours and Engagement in Teamwork

Financial Game Results. Financial results were expressed by stock price of the company (in Euro) point to teamwork effectiveness by outcome-oriented measure. Financial results are used to rank the researched teams. The final ranking of the companies (teams) was prepared and the teams were divided in two categories: "winning" or "losing", including first and second degree winning and losing teams.

Communicative Behaviours. Communicative behaviours were measured through video analysis of team members' behaviours during gameplay. Communicative behaviours relate to teamwork effectiveness as process-oriented measures. The analysis was run by trained behavioural judges who categorized observed behaviours. There were three categories of behaviours defined – see Fig. 1 below:

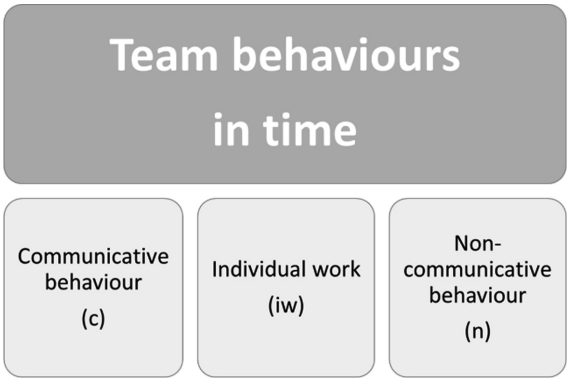

Fig. 1. Communicative behaviours of examined teams.

Communicative Behaviour (Code: c). Such behaviour: (1) contains an intention directed to a partner of interaction and (2) the behaviour is not an operation on an object serving other purpose but communication [25].

Individual Work (Code: iw). Operations on objects, when a person does not communicate directly with other team members and is busy with individual activity. For example: reading course materials, making necessary calculations with computer.

Non-communicative Behaviour (Code: n). Opposing the definition of communicative behaviour. This included all behaviours containing no intention towards the partner of interaction and serving other purposes than communicating with another team member.

Active Engagement in Team Activities. The level of active engagement was assessed by trained behavioral judges based on a video recording of game play situation. The experts were assessing the observed engagement on a 5-level Likert scale, where: 1 = "no active engagement in team activities, the team is not working" and 5 = "all team members actively engaged in team activities, full engagement".

2.3 Subjects

The research was conducted at the authors' university, during Business Simulation Games courses (employing "TOPSiM" managerial game). The subjects were the last year, part-time business students of master-level studies, aged from 21 to 42 (mean age = 27). Four student classes were researched in total, one of which was removed from the analysis of this study due to missing data. The students had previously finished their courses in finance, accounting, strategic management, marketing.

2.4 Research and Data Analysis Procedure

Research Procedure. The students gathered in their classroom were informed by the teacher about the opportunity to take part in a research study regarding group processes. The research situation was separated from the standard course situation, by introducing a researcher.

Next, the professor would leave the classroom. The researcher described the research procedure, and provided Belbin Self Perception Inventory for the subjects. After the questionnaire was filled, the teacher was invited back to the classroom and started the class by instructing participants to form 4–6 person teams [26].

All teams worked in the open space of the classroom, where two video cameras were registering their behaviors.

Data Analysis Procedure. After registering team members behavior in the classroom, the video material was processed for the use of behavioral judges: from each decisive round (90 min each) first 15 and last 15 min sections were selected for analysis. The experts were given assessment sheets, instructions regarding behavioral categories, and received training.

To provide the highest internal consistency of assessment, the experts were asked to work in pairs – discussing to agree on a certain behavior categorization if in doubt.

The research material was categorized by judges according to the instructions given: communicative behaviors and active engagement in team work were noted and categorized every 30 s of the video, for every person from each team. Dominant behaviors were categorized and noted down.

3 Results

3.1 Financial Results of Teams

For the financial results of each group and its teams see tables in Appendix 2. Financial results were used in character of grouping variable to rank researched teams.

3.2 Socio-emotional and Task–Oriented Balance in Teams

Table 2 below summarizes socio-emotional and task – oriented balance in teams, that was created based on Belbin Self-Perception Inventory questionnaire results. The table

contains additional information on final rankings of teams derived from their financial results. In addition, the number of roles that emerged in teams were noted.

Table 2. Socio-emotional and task – oriented balance in teams with ranked game results

	Ranking order	Team no	Game result	Socio-emotional/task - oriented proportions [%]	Number of present roles
Group 1	1	4	Winning 1	20/80	6 of 8
	2	1	Winning 2	20/80	6 of 8
	3	3	Losing 2	25/75	4 of 8
	4	2	Losing 1	25/75	5 of 8
Group 2	1	3	Winning 1	40/60	7 of 8
	2	4	Winning 2	60/40	8 of 8
	3	1	Losing 2	20/80	7 of 8
	4	2	Losing 1	**100/0**	6 of 8
Group 3	1	1	Winning 1	20/80	7 of 8
	2	2	Winning 2	**0/100**	4 of 8
	3	4	Losing 2	50/50	8 of 8
	4	3	Losing 1	20/80	7 of 8

This overview of researched teams shows that eight out of twelve teams were imbalanced towards task-oriented roles, while only one team held the opposite. There is one nominally balanced team, however, in cases of teams number one and two, in group three, there is a ratio pointing towards balance, as these two teams were composed of odd number of members (5 people). Thus, this could be interpreted as a presence of three balanced teams out of twelve researched teams.

It is also worth noting that each group forms its own micro-world. Group one is most homogenous in terms of team role imbalance – all of its teams have more task-oriented preferences than socio-emotional ones. Ratios for winning teams are 20:80 and for losing 25:75.

Group two is not homogenous, with winning teams tendency towards balanced ratios (40:60 and 60:40), while losing teams with a bias towards extreme values: losing team number one with 100:0 and losing team number two with ratio 20:80.

Group number three is also not homogenous. Winning team 1 and losing team 1 exhibited the same ratios of socio-emotional and task-oriented role preferences, which is 20:80. The only nominally balanced team with ratio 50:50 was a second degree winner. Second degree losing teams lacked team members with socio-emotional preferences.

Additionally, there was a summary of the number of different roles appearing in each team. Number of present roles varies from 4 to 8 (out of 8), and only two teams displayed a complete set of eight team roles. One of them was a second degree winner (team number 2 in group 2), and the other was ranked as second degree losing team (team number 4 in group 3).

Teams marked in bold (team number 2 in group 3, and team number 2 in group 2) were chosen for deeper analysis of their communicative results as extremely unbalanced team roles of all teams that were researched.

3.3 Communicative Behaviours and Active Engagement Results of Two Extremely Unbalanced Cases

Two teams were chosen for further in-depth investigation of their communicative patterns based on their extreme team role imbalance. Summary charts were created for team number two in group two and team number two in group three (see Figs. 2 and 3).

First Degree Losing Team. The team number 2 in group 2 (see Fig. 2) finished the game as a first degree losing team (Losing 1). There were no preferences for task-oriented roles diagnosed in this team. General communicative behaviours in time (per round) seemed consistently focused on communication and individual work: with communication varying from 56% to 45% and individual work varying from 42% to 49% throughout all decisive rounds. Non-communicative behaviours were consistently marginal throughout the whole gameplay varying form 1.54% to 6.33% with 6.33% being the highest ratio of non-communicative behaviours displayed, which appeared in round 3.

In closer analysis of communicative behaviours observations for the beginning and the end of each decisive round the bar graphs showed that this particular team's members communicated with one another more frequently in second halves of their decisive rounds.

Even though there were numerous communication behaviours displayed, the team started off from rank position number 3 after the first round. They managed to shift to second rank after round 2, and after that the team gradually dropped their position to the bottom of the ranking.

It is also worth noting that the team started the game off with extremely engaged attitude of all its members (scoring 4.94 points out of 5 in behavioural judges assessment), which lasted to the end of round 2. After that round the displayed engagement dropped to be assessed 3.07 points and in next two rounds it gradually shifted to the value of 3.93. This particular breaking point of engagement occurred simultaneously with a drop in the ranking position.

Second Degree Winning Team. The team number 2 in group 3 (see Fig. 3) finished their game as a second degree winner (Winning 2). There were no preferences for socio-emotional-oriented roles diagnosed in this team. General communicative behaviours in time (per round) seemed to gradually increase, with two 7–8% drops in round one and three. The team started off with 46.86% communicative behaviours ratio and finished with the ratio of 70.83% communicative behaviours, consequently increasing communication throughout their gameplay. Their individual work per round varied from 45.61% to 20.42%. Non-communicative behaviours of this team held the level below 1% for 3 out of five decisive rounds. However in round 1 and round 3 they increased to 7.53% and 8.76% respectively.

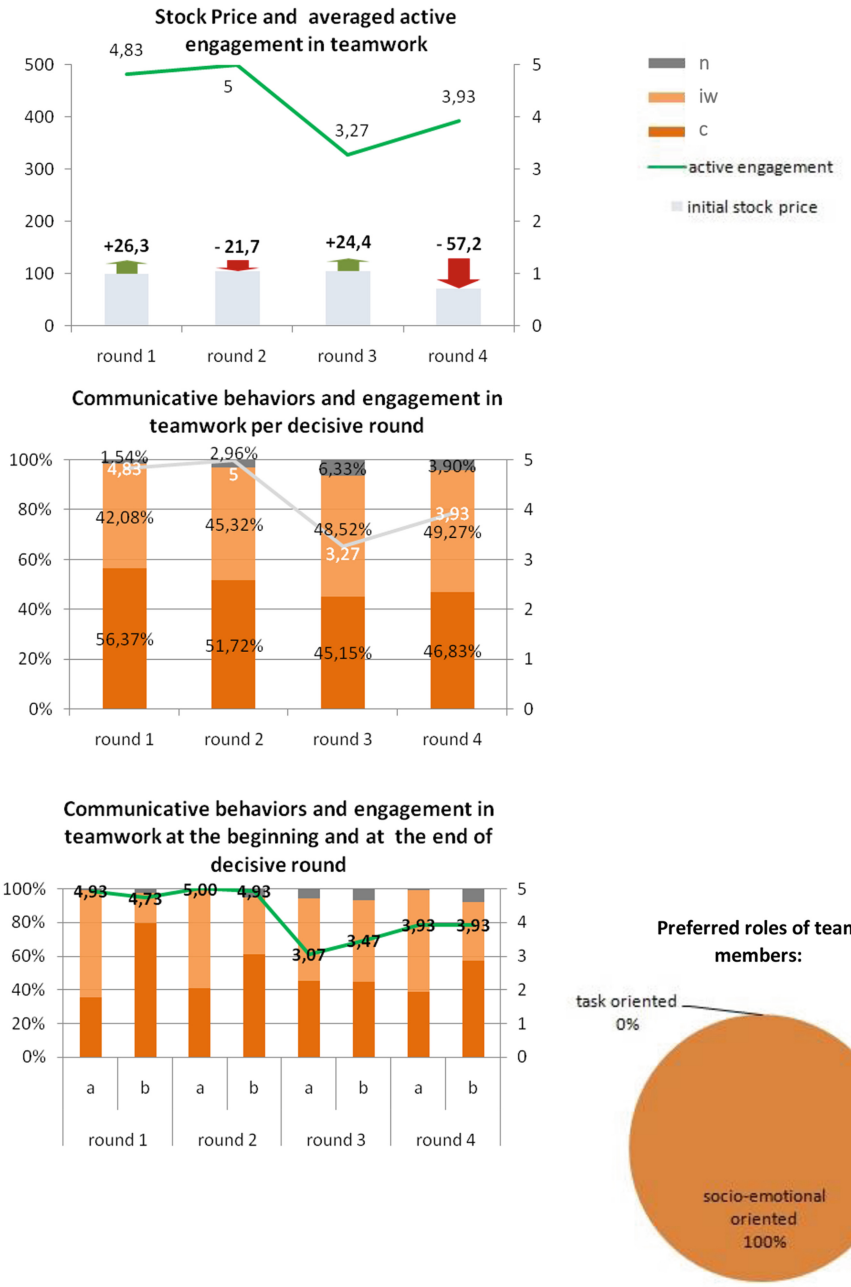

Fig. 2. Chart of the first degree losing team (Team no 1 in Group 2)

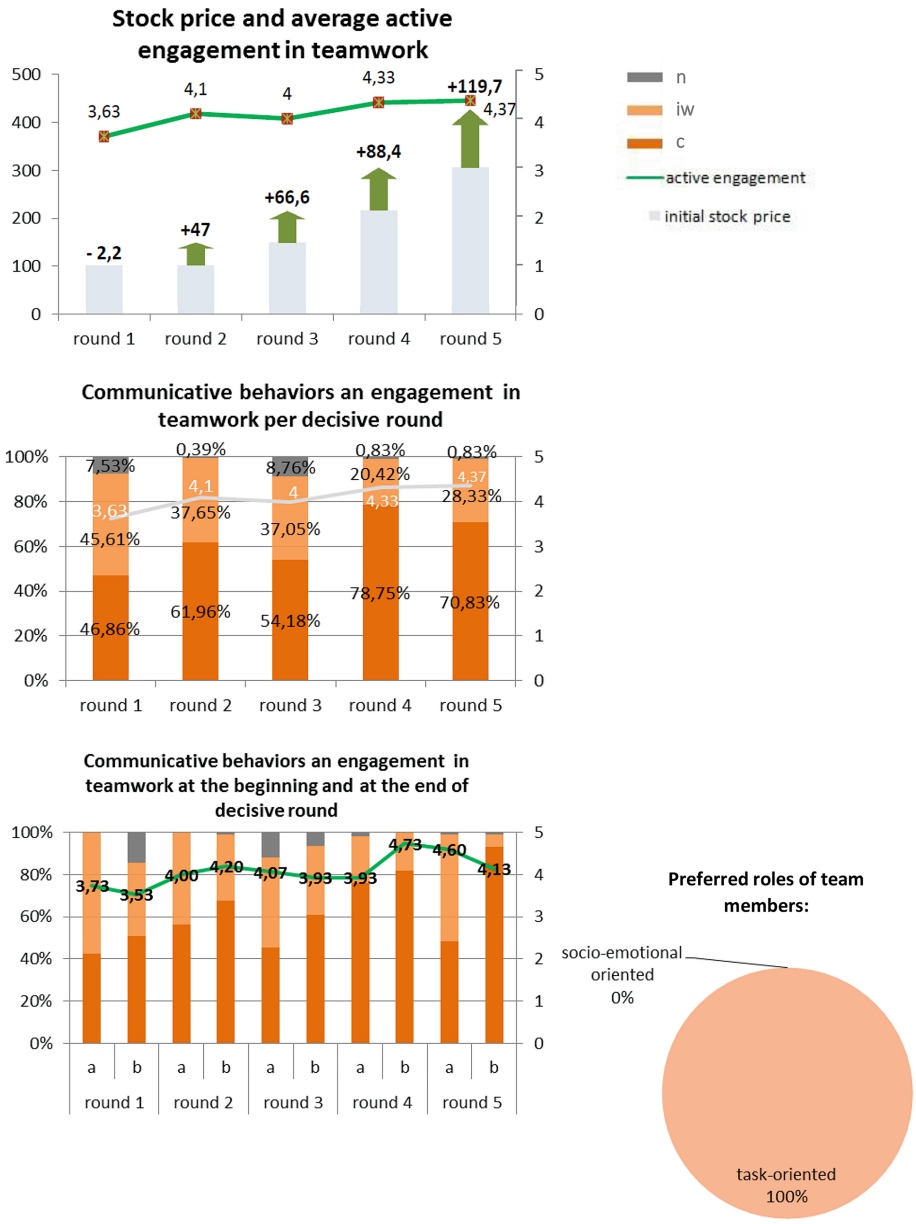

Fig. 3. Chart of the second degree winning team (Team no 2 in Group 3)

In closer analysis of communicative behaviours observations for the beginning and the end of each decisive round the bar graphs show that this particular team members communicated with one another more frequently in the second halves of their decisive

rounds, reaching their most extreme difference in last - fifth - round shifting from 48.33% to 93.33%.

The team started the game off ranked second in round 1 and shifted to rank 1 for rounds 2,3, and 4. In the fifth round – simultaneously to the communication behaviours biggest shift - the team lost their leading financial position and finished the game ranked as second.

This particular team started the game with moderately engaged attitude of its members (scoring 3.53 averaged points out of 5 in behavioural judges assessment). However, their engagement was increasing consequently through the gameplay (to end the game scoring 4.37 averaged points). The engagement progressed in parallel with financial progress of this team.

4 Discussion

Communication processes can be viewed as transactions, where two conditions need to be fulfilled: (1) each person is simultaneously a sender and a recipient of verbal and non-verbal messages, and (2) all parties involved in the communication are influenced and influence one another [11].This approach illustrates how team communication is a dynamic process that undergoes constant changes, therefore, this study focused on both: results and processes taking place during the gameplay. Thus, methods employed for the purpose of data collection and analysis of this study were combined in accordance to both, process- and outcome-oriented approaches of measuring effectiveness. This was performed in order to bring a wider and more detailed picture to the research situation. Nevertheless, these tools also comprise certain limitations that had to be taken into consideration.

Some of them were already addressed by Palyga and Wardaszko in their original study on process-oriented research method for teamwork effectiveness assessment in Business Simulation Games [8]. To name the foremost, it was stated that there is no possibility for results generalization, as the scale of original study was not large enough. Secondly, the research method forged for the purpose of this study is still untested and needs further calibration. Thirdly, although the results of application of the method brings some very interesting insights, there is no causal reasoning allowed to be run here.

Also, Belbin's Self-Perception Inventory (SPI) is widely criticized as a tool that does not conform fully with all psychometric requirements of a psychological test [27, 28]. It is, however, very often used by researchers and practitioners for its coverage of very relevant concerns in teamwork theory and practice. SPIs relationship with teamwork is not conclusive as well, however some researchers claim this fact to be a reason for further exploration of this tool's properties and applications [29, 30]. Nonetheless, Polish validation of this questionnaire which was used for the purpose of this study is claimed by its authors as worth attention and offering some valuable properties.

Another important issue to be addressed, concerns the procedural decisions regarding this study. Firstly, the students participating in the research situation were allowed to create their teams by themselves. Such decision was made in order to obtain a natural team composition, allowing better communication from the start [31–36]. It is also worth addressing that the cameras used to record the teams could influence teams behaviors by

distracting participants attention. Nonetheless, a direct observation by behavioral judges could intensify such phenomenon even more. In order to mitigate such influence, the participants were informed about (1) cameras presence prior to research beginning and (2) possibility of withdrawal from participation in research at every moment of the recording. All questions and requirements about anonymity, confidentiality and procedures of recording were answered. On the side of behavioral judges there was instruction given to note behavioral indicators of interest in cameras presence (like direct gazing, pointing and looking at the devices). The judges reported few indications of interest in recording devices, but the amount was considered insignificant.

Results obtained in the three researched student groups might serve as an example of how each group forms different internal culture and how each team develops its own "personality" over time [6]. Results obtained by two teams chosen for case study analysis emerged as extremely unbalanced in terms of socio-emotional and task-oriented role preference. Imbalance in favor of task-oriented roles was observed in all researched groups (majority of the teams) which could constitute a premise about managerial population possessing such characteristic. However the sample size does not allow such reasoning and permits to interpret this observation only as a suggestion for further exploration.

Two extremely imbalanced teams came to the attention of the close observation and analysis of this study. Obtained results suggest that neither of extremities in preferred roles (either 100% task-orientation, nor 100% socio-emotional-orientation) is fully beneficial in terms of team effectiveness. It is suggested in the reference literature that excessive focus on only one role type might restrain the other and lead to a regression of group development [37]. However, in the light of this research, it seems that the team consisting of only task-oriented participants performed more effectively than purely socio-emotionally oriented team. This study does not attempt to answer the question why such situation occurred, yet its results might serve as a premise to explore this matter further.

Appendix 1. Belbin Team Role Typology

Type	Symbol	Typical feature	Positive qualities	Allowable weaknesses
Company worker	CW	Conservative, predictable, dutiful	Organising ability, Practical common sense, Hardworking, Self discipline	Lack of flexibility, unresponsiveness to unproven ideas
Chairman	CH	Calm, self controlled, self confident	A capacity for treating and welcoming all potential contributors on their merit; and without prejudice. A strong sense of objectives	No more than ordinary in terms of intellect or creative ability

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Type	Symbol	Typical feature	Positive qualities	Allowable weaknesses
Shaper	SH	Highly strung, dynamic, outgoing	Drive and a readiness to challenge inertia, ineffectiveness, complacency or self deception	Proneness to provocation, irritation and impatience
Plant	PL	Individualistic, serious minded, unorthodox	Genius, imagination, intellect and knowledge	Up in the clouds, inclined to disregard practical details or protocol
Resource investigator	RI	Extroverted, enthusiastic, curious, communicative	A capacity for contacting people and exploring anything new. An ability to respond to a challenge	Liable to lose interest once the initial fascination has passed
Monitor evaluator	ME	Sober, unemotional, prudent	Judgement, discretion, hard headedness	Lacks the inspiration or the ability to motivate others
Team worker	TW	Socially orientated, rather mild, sensitive	An ability to respond to people and to situations, and to promote team spirit	Indecisiveness at moments of crisis
Completer finisher	CF	Painstaking, orderly, conscientious, anxious	A capacity for follow through. Perfectionism	A tendency to worry about the small things. A reluctance to "let go"

Source: Belbin (2004)

Appendix 2 – Game Results

	Share price in EUR					Final rank
Group 1	Round 0	Round 1	Round 2	Round 3	Round 4	
Team 1	100	106,6	136,2	189,2	255,5	Winning 2
Team 2	100	120,1	78,8	145,6	158,7	Losing 1
Team 3	100	173,5	128,5	182,8	235,8	Losing 2
Team 4	100	104,7	171,4	214,3	275,3	Winning 1

	Share price in EUR					Final rank
Group 2	Round 0	Round 1	Round 2	Round 3	Round 4	
Team 1	100	141,3	156	122,9	137,8	Losing 2
Team 2	100	126,3	104,6	129	71,8	Losing 1
Team 3	100	159,9	101,8	162,6	194,6	Winning 1
Team 4	100	115,4	80,3	136,1	186,7	Winning 2

	Share price in EUR						Final rank
Group 3	Round 0	Round 1	Round 2	Round 3	Round 4	Round 5	
Team 1	100	78,4	142,9	189,7	299,1	519	Winning 1
Team 2	100	97,8	144,8	211,4	299,8	419,5	Winning 2
Team 3	100	112	99,4	168	125,7	0	Losing 1
Team 4	100	76,6	135,5	125,6	168,6	134,2	Losing 2

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