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Team members' direct participation in decision-making processes and the quality of decisions

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Abstract

PURPOSE: *Do teams manage to reach better decisions than those made by individuals? Numerous studies have delivered inconclusive results. Meanwhile, participation in decision-making can take various forms and is not limited to consensus group decisions, and the influence of the various forms of participation on the quality of decisions has been less frequently examined. The aim of the research was to determine the effect on decision quality of changing the form of direct participation in the decision-making process in the case of complex, multi-stage problems.* ***METHODOLOGY:*** *The article presents the results of a long-term experiment in which 598 teams of 2,673 people took part. The participants were asked to solve a decision problem using three decision-making styles: autocratic, consultative, and group. The participants played the role of members of a newly established project team that must plan its own work. The task concerned a problem that requires the analysis of a number of dependencies between sub-problems, in contrast to eureka-type problems. The decision problem was new to the participants, making it impossible to apply known solutions; a creative approach was therefore required. The decision was then compared with the optimal solution established by experts. Decision quality was based on the deviation of the proposed solution from the optimal solution.* ***FINDINGS:*** *The results of the experiment confirm the significant synergistic potential of increasing direct participation in decision-making for complex, multi-stage problems. A significant proportion of teams made better decisions as a result of increasing direct participation – replacing autocratic decisions with consultative and group decisions. The quality of consultative decisions was roughly in the middle of autocratic and group decisions. By using group*

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decision-making, teams made better decisions than the average individual decision and came closer to the decision quality achieved by the best team members. This effect was universal, observed both in the strongest and weakest teams. It should be remembered that, while group decision-making has the potential for synergy, it is not always achieved. Group decision-making markedly reduced the risk of making highly misguided decisions, and it can be reasoned that direct participation protects against serious mistakes more than it guarantees the best possible results. ***IMPLICATIONS****: Team leaders should be familiar with different decision-making styles, their advantages and disadvantages, and the scope of their application. This research suggests that increasing team members' participation to a consultative role and even better, a full participatory role, increases the quality of the decision. With the growing complexity of organizations that have to deal with accelerating change, technology development and increased competition, creating structures that can flexibly respond to the challenges of the environment requires the participation of team members at all managerial levels. The use of consultative and group decision-making styles for complex and multi-stage problems supports this process. The group decision-making style can bring better quality, but it has its limitations and it is not always possible to use it. It requires a team of highly competent people who identify themselves with the interests of the organization. Otherwise, the consultative form will bring better results.* ***ORIGINALITY AND VALUE:*** *For the first time, an empirical study analyses the case of consultative decision-making, in which the team leader consults the individual opinions independently to finally come up with a final "team" decision. This approach is widely used by team leaders and managers in the field. This study shows that this approach constitutes an improvement over the individual (autocratic) one but still falls short of the group decision-making approach. Finally, this study which has been done with the largest number of participant teams (598 teams, 2,673 individuals), professionally active post-graduate students and over a 24-year period allows a sound statistical confirmation of the proposed decision quality improvement when moving from individual to consultative and group decision-making styles.*

Keywords: *participation in decision-making (PDM), decision quality, consultative decision-making, group decision-making*

INTRODUCTION

Direct participation in decision-making (PDM) is a process of immediate personal involvement of an organization's members in decision-making (Cotton, 1988), and it is commonly believed among researchers that there are many advantages to and significant potential for PDM (Lorscheid & Meyer, 2021). Involving team members in decision-making is considered one of the most desirable options for improving the quality of management processes, especially in areas in which creativity and the uniqueness of products are a source of success. Rogelberg et al. (1992) noted that the search for solutions to organizational problems, the creation of new products,

and the development of marketing strategies are frequently delegated to temporary teams under the assumption that the solutions they develop will be better than an individual's work.

It is generally believed that groups have the potential to make better decisions on complex problems than individuals because they can combine diverse information, perspectives, and skills (DeVilliers et al., 2016). Collective decision-making bodies are often used to mitigate individual psychological biases or mitigate problems of self-interested behavior (Hafner-Burton et al., 2017).

Nevertheless, groups do not always outperform individuals. A number of studies are conducted on problems in the group decision-making process leading to incorrect decisions (Takemura, 2021). For example, group think theory explains group interaction patterns that may result in bad decisions (Esser, 1998). Biased information seeking, conformity pressures and the desire to preserve harmony, group homogeneity, or other social and contextual influences can suppress effective group decision-making (Schulz-Hardt et al., 2002; Bazerman & Moore, 2012).

Do teams manage to reach better decisions on complex problems than those made by individuals? Previous research is inconclusive; Cooper and Kagel (2005) suggested that small teams engaged in implementing strategic tasks deliver results above initial expectations, but other studies have found no significant improvements or even a deterioration in the quality of decisions by teams compared with individuals (Kerr et al., 1996a; Sutter et al., 2009). Studies of authoritarian and collective decision-making processes in the area of technological innovation bring ambiguous results (Saenz-Royo & Lozano-Royo, 2023).

Besides individual and group decisions, there are other decision-making styles. For example, many team leaders make a significant proportion of their important decisions after consulting team members. Sometimes consultations are conducted with selected members, other times with the entire team. Meanwhile, most of the PDM research has focused on comparing one-person decision-making with group decision-making (e.g., Casari et al., 2012; Hodder, 2001; Saenz-Royo & Lozano-Royo, 2023), but the question of the influence of different forms of participation on the quality of decisions has been less frequently examined.[4] Although there are studies on consultative decision-making, they mostly concern determinants (Selart 2005; Hammoud 2011), procedures, and tools supporting managers (Chen & Tsai, 2015), rather than the effectiveness of this decision-making style.

4 It is worth noting that research on the effectiveness of team decision-making undertaken decades ago does not fully correspond with the changing competences of employees, the modern availability of information for decision-making, or the complexity of contemporary decision-making problems.

In conclusion, we see a research gap consisting in the lack of knowledge on how the effectiveness of autocratic, consultative and group decision-making differs in the case of complex problems. The aim of the current study was to determine the effect on decision quality of changing the form of direct participation in the decision-making process in the case of complex and multi-stage problems. Such a description of the problem is met if: 1) solving the problem requires knowledge from various areas of the company's operation, which is rarely possessed by one person, 2) work on the search for a solution is multi-stage, and the solution to the problem consists of a series of decisions that are related to each other – in contrast to eureka-type problems. These are problems that require original ideas and the abandonment of routine solutions based on experience or procedures. We took a similar approach to Hamada et al. (2020) and Hodder (2001) who investigated the use of different decision-making styles in real-life situations involving complex information integration. Our study examined three decision-making styles: autocratic, consultative, and group.

LITERATURE REVIEW

Zieleniewski (1976) described a decision as a non-random choice of action, but the output of the decision-making process is the decision itself, rather than the action, being a conscious selection of one of the options recognized as acceptable. Business decisions in a hierarchical context can be made both by a manager alone and with the participation of employees; in the latter case, the manager shares the right to make the decision, delegating to employees a part of the decision-making process.

Dachler and Wilpert (1978) emphasized that employee participation is not a homogeneous phenomenon, but rather takes several distinct forms, which can be distinguished along several dimensions: 1) mode of participation, ranging from direct to indirect; 2) level of access to information and employee influence on the decision made; 3) degree of formalization, ranging from formal to informal. Direct participation involves immediate personal involvement of the employees, while indirect participation involves a form of employee representation. Level of access to information and employee influence takes the form of a continuum beginning with employees not being informed in advance about the decision, ending with decisions made by the employees. The degree of formalization ranges from formal participation regulations within an organization to informal participation as part of the superior–subordinate relationship, regardless of regulations.

In our study we analyze different decision-making styles, both formal and informal. They include (Vroom & Yetton, 1973):

- autocratic – the leader makes the decision by himself and consults subordinates only to obtain information when necessary;
- consultative – the leader shares the problem with subordinates to get their opinion and then he/she makes the decision by him/herself; and
- group – the leader shares the problem with subordinates in a group meeting and attempts to reach group consensus on solutions.

Previous research on the effects of PDM has taken place both at the whole-organization level and with individuals directly involved in the decision-making process. The first type of study considered the effect of participation on the financial results of enterprises (Alsughayir, 2016; Spreitzer & Mishra, 1999) and on work productivity (Cummings & Malloy, 1977; Nwosu et al., 2020; Nazari et al., 2022), while the second examined the influence of participation on employee involvement (Benjamin, 1982; Rathnayake, 2017), motivation (Alzaanin & Sulaiman, 2020; Irawanto, 2015), satisfaction (Black & Gregersen, 1997), absenteeism (Hammer et al., 1981) and on the quality of the decision (Casari et al., 2012).

It is the last of these – the quality of the decision – that would seem very crucial and one of the key determinants of the choice of the decision-making style. Researchers use many different measures to evaluate the quality of decisions and the decision-making process (Schafer & Crichlow, 2010). A full assessment of the quality of a decision is possible only after its effects materialize, i.e., it can be significantly postponed in time. The balance of effects, positive and negative, can be the basis for such an assessment. The point of reference in the assessment may be the goals of the decision maker at the time of making the decision. Sometimes the assessment takes a financial dimension – calculation of the net present value of the effects of the decision (Schilling, 2007). The assessment carried out immediately after the decision is made, when its full effects are not yet known, is of a different nature. The evaluator may use a forecast of the effects of the decision and the degree of achievement of the decision maker's goals. A different approach involves comparing the decision made with a best decision indicated by a panel of experts (Schilling, 2007). In this case, the quality of individual or group judgment is defined as the absolute value of the discrepancy between the judgment and the true value determined by experts (Einhorn et al., 1977). This approach was adopted in our research, as in other studies comparing decision-making methods (e.g., Hamada et al., 2020; Hodder, 2001).

Researchers point to a number of phenomena that may occur during the participation process and may affect the quality of decisions (Kerr et al., 1996b; Rutka, 2007; Tindale et al., 2003; Töre & Uysal, 2022; Tyler & Smith, 1998). Potential positive factors include:

- the option of analyzing the problem from multiple perspectives based on the competences of the team members;
- interactions within the team creating synergy; and
- overcoming over-specialized or subjective perceptions of the problem.

On the other hand, factors that can adversely affect decision quality include:

- the risk of the decision-making process being dominated by team members with an intellectual or formal advantage over others;
- the risk of more extreme decisions, either riskier or more cautious than individual decisions; and
- the risk of pressure to maintain group cohesion overcoming important objections and creating false support.

Much research has been done on the dynamics of group processes and the factors affecting decision quality (Hall & Watson, 1970). A separate stream of research is devoted to tools supporting the decision-making process, e.g., decision models (Feng et al., 2022), decision trees (Diao & Zhang, 2021), and IT tools (Hema & Kumar, 2022).

The effect of direct participation on the quality of decisions is most commonly examined experimentally. For example, in Casari et al. (2012), participants made a series of decisions about the price to be proposed for acquiring an enterprise. Sutter et al. (2009) compared the results achieved by individuals and by teams during an auction. Some researchers have used experimental designs in which teams had to make decisions in (fictional) life-threatening survival scenarios. The experimental situations were similar to those used in the training of management staff, being set in a desert (Lafferty & Pond, 1974), in an area affected by an earthquake (Hodder, 2001), or the most popular, on the surface of the moon – the "NASA moon survival task" (Hall & Watson, 1970). In such tasks, the participants typically must rank a dozen or so items according to their importance for the team's survival in a hypothetical situation. The task is thus new to the participants, complex, and requires detailed analysis and evaluation. Many tasks that team leaders must deal with, especially at higher levels, are of a similar nature. The quality of collective decisions in these studies has been found to be better than individual decisions, on average (e.g., Hodder, 2001; Miner Jr., 1984). For

example, in Hamada et al. (2020) study error scores for group decisions were significantly lower than individual decisions.

In most studies, researchers focus on comparing individual decisions with group decisions. Meanwhile, in practice, team leaders also make decisions after consulting their team members. The consultations may enable the expansion of the list of decision options and a more complete analysis of their possible effects. This decision-making style is much less researched. The published research concerns, for example, factors influencing the frequency of using a consultative decision-making style: psychological factors related to leaders (Selart, 2005), and national culture (Hammoud, 2011). Other research aims to refine this decision-making style. For example, Chen and Tsai (2015) propose an algorithm to support individual decision-making through a quantitative analysis of the recommendations of a large group of experts. However, there is no comparison of consultative style and its effectiveness in relation to individual and group decisions. As a result, a research gap can be identified: lack of knowledge on how the effectiveness of autocratic, consultative and group decision-making differs in the case of complex problems.

Three hypotheses were proposed to address the research gap. The first of them is based on results from experimental research (e.g., Hamada et al., 2020; Hodder, 2001; Miner Jr., 1984), but with the addition of a consultative style. Including the additional style in the hypotheses allows one to check whether the use of a consultative style means a significant difference, enabling a decision similar to a group decision, or will it rather be closer to an autocratic decision. When formulating the hypotheses, we adopted the perspective of team members and team leaders.

H1: A team leader who uses team members' direct participation for complex and multi-stage problems increases the probability of a higher quality decision than when making a decision autocratically.

The following two hypotheses concern the problem of synergy that can be achieved through participation in decision-making. Groups achieve synergy when their collective cognitive performance exceeds the performance of individual group members (Larson Jr., 2007). In previous studies of group decisions, synergy was measured by comparing the quality of the group decision against those made by individual members of a group. Researchers distinguish weak and strong cognitive synergy (Meslec & Curşeu, 2013). The first one arises when a group decision has a higher quality than the average quality of individual decisions of group members. The second synergy is observed when the group decision has a higher quality than the best individual results in a group.

In prior research, groups decisions in judgmental tasks have been of higher quality than the average of individual decisions – positive weak cognitive synergy was observed (Laughlin et al., 2003; Hamada et al., 2020; Hodder, 2001). However, taking the best individual decision in a team as the benchmark can change the result significantly. Previous research of strong cognitive synergy is inconclusive. Some studies indicate the group was able to achieve a better score than the best individual decision (Crede & Sniezek, 2003) while others showed the opposite effect (Bonner et al., 2004).

The authors are not familiar with studies that analyzed the occurrence of synergy in the use of the consultative style. Therefore, we propose hypotheses that will allow the verification of the occurrence of both types of synergy in both group and consultative decision-making styles.

The following hypotheses address this issue:

H2: A team leader who uses team members' direct participation for complex and multi-stage problems increases the probability of a higher quality decision than the average of the individual members of a group.

H3: A team leader who uses team members' direct participation for complex and multi-stage problems increases the probability of a higher quality decision than the best individual decision from among the team members.

METHODOLOGY AND RESEARCH APPROACH

Experiments have been used in management science for a long time. Researchers used them analyzing inventory decisions (Chen, Kok & Tong, 2013), buyer and seller behaviors (Davis, Katok & Kwasnica, 2011), and demand forecasting behaviors (Kremer et al., 2011). Experiments have become an important method of studying the behavior of leaders, in particular the way they make decisions. For example, Coleman (2004) analyzed factors affecting managers' willingness to share power with subordinates, Ashill and Jobber (2014) explored the role of manager's experience on the decision-making process. Decision-making styles using the experimental method were also studied. An experimental design was chosen in order to allow the study of causal relationships and to provide a significant level of control over the study. The design of our research was inspired by previous experiments in which teams had to make decisions in life-threatening survival scenarios, e.g., the NASA moon survival task (Hall & Watson, 1970) and Earthquake – A Cooperative Learning Experience (Hodder, 2001). The experiment was prepared and conducted by Rutka and Czerska.

Experimental design

Definitions

- Team members' direct participation is the replacement of single-person decision-making by a team leader (autocratic) with decision-making by a team leader following consultation with team members (consultative decision) or with a decision made by the group as a whole (group decision).
- Independent variable is the decision-making style. In order of increasing level of participation, these were: 1) autocratic decision – the leader decides unilaterally and announces the decision without the participation of the group; 2) consultative decision – the leader consults individually with each team member and then decides; and 3) group decision – all participants reach a consensus.
- Dependent variable is decision quality.

Procedure

The participants of the experiment were faced with the task of organizing the work of the newly appointed project team. The task was to decide on the correct order for 20 listed tasks that comprised the implementation of a project. Exemplary tasks included: defining the required competencies from team members, defining checkpoints, carrying out coordinating activities, developing variants of project implementation, defining the necessary resources (a list of all tasks is described in Appendix 1). The scope of the required decisions covered many areas of the company's activities: finance, human resources, logistics, operations (complex problem). The solution to the problem was to make decisions that were interrelated, with certain components of a project determining the next components. For example, a prerequisite for starting the training of participants was defining the required competencies of team members, which in turn required prior determination of the project's objectives. The participants had to analyse a number of dependencies between sub-problems (multi-stage problem), in contrast to eureka-type problems. The decision problem was new to the participants, making it impossible to apply known solutions; a creative approach was therefore required. The design of the experiment was inspired by the NASA moon survival task, with some differences, including the topic of the task itself, the number of items to be ranked (20 instead of 15), and the introduction of an additional decision-making style – consultative decision-making.

The chosen solution was then compared with the optimal solution. Such a single correct solution was established by a panel of experts – academics

specializing in project management. For each of the 20 tasks, the absolute deviation between the assigned position and the experts' position was calculated, and the values of all deviations were then totaled. The resulting total – the error score – represented the overall scale of the deviation from the optimal solution; the lower the score, the higher the decision quality, which was the dependent variable in the experiment (an example of such a calculation can be found in Appendix 1). The experiment was carried out in the following stages:

- Introduction: The researchers presented the protocol of the experiment to the participants.
- Stage 1: Individual decision-making. Each of the participants independently analyzed the task and determined the order of implementation. This stage can be equated with autocratic decision-making.
- Stage 2: Consultative decision-making. The participants were randomly assigned to teams of 4–5 people, and team leaders were chosen by the team members. The leaders then discussed the problem individually with each team member, and after listening to everyone's opinions, made the choice on their own.
- Stage 3: Group decision-making. The team leader acted as a discussion moderator, otherwise participating with the same rights as other team members. The leader could not impose an opinion and was obliged to accept the solution approved by the group. The group was expected to make decisions by consensus on each issue (unanimous accord), and vetoes were not permitted, as was described in Hall and Watson (1970).

The order in which the various decision-making styles were used was the same for each team participating in the experiment. In this way, the risk that the results of team discussions (group decision-making) would influence individual results (autocratic decision-making) was eliminated. A similar approach was used by Hodder (2001) and Meslec et al. (2014).

After Stage 3, the participants learned the experts' solution to the task and then calculated the deviations between their allocated positions and those of the experts.

Throughout the experiment, the researchers observed the teams, reminding participants of the rules as needed to ensure the protocol was followed. At the end of each experiment, the authors collected the obtained results – paper forms containing the error scores of each team.

Conditions

1) To avoid one team member dominating the decision-making process, the teams should be composed of people with similar levels of knowledge regarding the decision problem. Participants with experience in project management would able to achieve better results than others. Before starting the experiment, the researchers asked participants about such experiences, and such people were excluded from the experiment.
2) Team leaders are chosen by their members but should not be formal superiors of the team members or persons with titles, diplomas, or certificates that could be a source of advantage in the discussion on the solution to the problem.
3) There should be no signs of antipathy or especially hostility among the team members. This condition applies particularly to the relationships between the team leader and its members.
4) All team members should be interested in achieving the best possible result regardless of whether it is credited to individual members of the group, the leader, or the entire team.
5) The solution proposed by the participants of the experiment should be expressible using measurable values that can be compared with an optimal solution established by experts. Decision quality is then based on the deviation of the proposed solution from the optimal solution (expressed in absolute numbers).

Sample

The sample consisted of postgraduate students who were active professionals as experiment participants (Table 1). Data were collected in Poland between 1994 and 2017, and the same experimental design was used throughout this period. The experiment was not continued after 2017. Such a long period of the experiment resulted from two goals: 1) conducting the study on a quantitatively significant research sample, 2) determining whether the result of the experiment changes with the passage of time and changing conditions. Due to the limited volume of the article, the authors did not analyze in detail the development of the results of the experiment over 24 years (second goal mentioned above). However, such a long study period made it possible to collect a very large sample – 2,673 people took part, comprising 598 teams of 4–5 people each. Participants took part only once and received no remuneration for their participation.

Table 1. Participants by year

Year	Numbers of teams					Number of participants
	Master of Business Administration (MBA)	Postgraduate management studies (PSM)	Postgraduate HR studies	Healthcare Management postgraduate studies (ZPL)	Total	
1994	0	6	0	0	6	30
1995	0	16	0	0	16	80
1996	0	11	0	0	11	55
1997	6	28	0	6	40	200
1998	6	20	0	7	33	165
1999	4	12	0	7	23	115
2000	5	15	0	9	29	145
2001	6	15	4	10	35	175
2002	5	15	5	4	29	145
2003	5	7	9	6	27	135
2004	3	0	0	6	9	45
2005	3	6	7	7	23	115
2006	4	9	17	7	37	148
2007	0	9	13	9	31	124
2008	0	16	15	9	42	168
2009	0	14	17	14	45	180
2010	0	16	10	8	34	136
2011	0	8	0	12	20	80
2012	0	7	0	13	20	80
2013	0	0	0	5	5	20
2014	0	15	0	8	23	92
2015	0	17	0	9	26	104
2016	0	9	0	7	16	64
2017	0	9	0	9	18	72
Total	**47**	**280**	**97**	**174**	**598**	**2673**

Limitations of the research method

- The absence of a control group makes it impossible to eliminate the possibility that factors other than the independent variable may have caused changes between the stages. It should be noted, however, that the stages took place immediately after one another, limiting this risk.

- The team leader was not chosen randomly. The selection was made by the group from among its members, and the researchers did not interfere in the process of selecting the leader. However, it should be emphasized that as each team member had the same possibility of being chosen as a team leader by their peers this may constitute a sort of randomness.
- The non-random selection of the participants may make it difficult to generalize the results to all professionally active people. A deliberate sampling method was used, with only postgraduate students currently in managerial positions or working people aspiring to managerial positions participating. All had higher education, they represented various fields of study, they did not have business or employment relationships that could affect the freedom and openness of the discussions, and there were no conflicts of interest between the members of the group. To ensure these conditions were met, the researchers abstained from conducting research inside enterprises and institutions.

Statistical methods

The primary data were the distributions of the error scores, each score being the sum of the deviations between the experimentally assigned ranks and the expert-assigned ranks. The assumption of normality of these distributions was tested using the Kolmogorov–Smirnov normality test and the Shapiro–Wilk test. The normality assumption was found to be violated, so the analysis of the differences between the distributions was performed using Friedman's ANOVA (when comparing multiple distributions simultaneously) and the Wilcoxon signed-rank test for pairwise comparisons. The Kruskal–Wallis ANOVA and post-hoc tests were used to assess differences in pairs between the distributions. The significance of changes in the distributions of variables over time was tested using the linear trend function and the significance test of the trend function coefficient. Calculations and graphs were made using Dell Statistica 13.

According to the approach used by Hamada et al. (2020) and Meslec et al. (2014), we calculated synergy as follows:

1) Weak cognitive synergy:
   - Consultative: the difference between the average individual error score in the team (Xi) and the error score of the team leader (Kk) (consultative decision);
   - Group: the difference between the average individual error score in the team (Xi) and the error score of the team consensus (G)

2) Strong cognitive synergy:
   - Consultative: the difference between the error score of the best team member (I min) and the error score of the team leader (Kk) (consultative decision);
   - Group: the difference between the error score of the best team member (I min) and the error score of the team consensus (G).

RESULTS

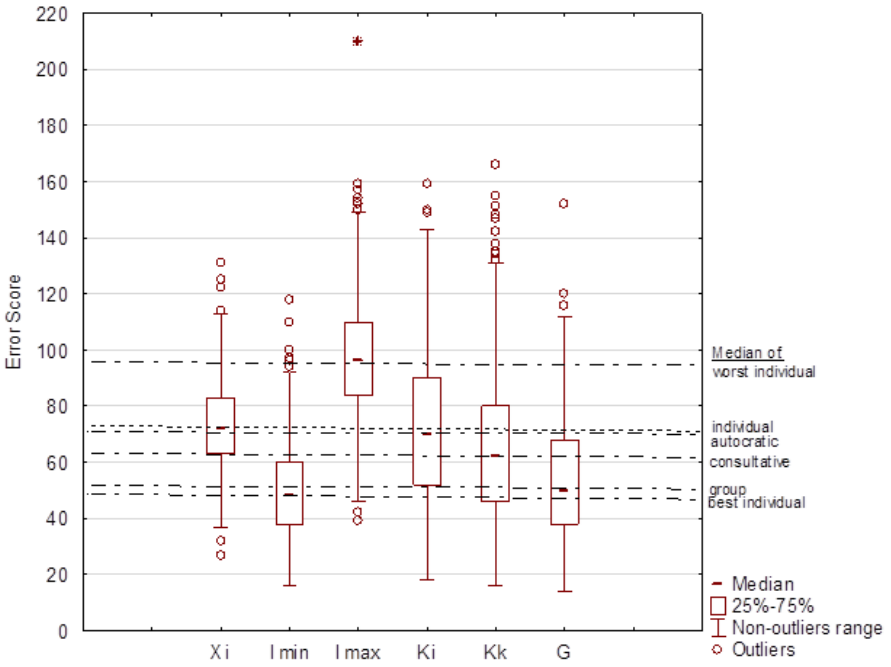
The participants calculated the sums of the deviations between their allocated values and the experts' values. The smaller this error score, the closer the decision of the participants was to that of the experts and thus the higher the decision quality. The following variables were then derived and used in the analyses (Table 2):

Table 2. Error score variable definitions

Variable	Description
Xi	The average score of the individual members in the team
I min	The best individual score in the team
I max	The worst individual score in the team
Ki	The individual score from Stage 1 of the participant who was chosen in Stage 2 to act as team leader (autocratic decision)
Kk	The team leader's score following consultation with the team in Stage 2 (consultative decision)
G	The score of the team consensus decision in Stage 3 (group decision)

The error score distributions are presented as boxplots in Figure 1. Differences were observed between the individual scores of the team members, the scores of the team leaders, and the group scores. As the level of PDM increased, the error score decreased, meaning an increase in decision quality.

The autocratic scores (Ki: Mean = 71.70, SD = 25.65) did not differ statistically significantly from the average individual scores (Xi: Mean = 72.72, SD = 15.62; Wilcoxon signed-rank test $p = 0.08$), meaning that the team leaders did not have a significant knowledge advantage over the team members at the beginning of the experiment regarding the subject of the task, and any increase in competence or improvement in the quality of decisions was therefore due to the exchange of views with team members.



Note: Xi = average individual result; I min = best individual result in each team; I max = worst individual result in each team; Ki = autocratic; Kk = consultative; G = group

Figure 1. Distributions of error scores

This is supported by the lower consultative error score in Stage 2 (Kk: Mean = 64.36, SD = 24.08; Wilcoxon signed-rank test $p < 0.00001$) and the even lower group score in Stage 3 (G: Mean = 54.41, SD = 21.60; Wilcoxon signed-rank test $p < 0.00001$). As PDM increased, the error score decreased, meaning increasing decision quality.

Changes in median error score of the individual decisions over time from 1994 to 2017 were analyzed (Figure 2). The median error score in the period from 1994 to 2003 did not increase significantly (coefficient of the linear trend function $b = -0.34$, $p = 0.1108$) and only once exceeded 70 points, while in the period from 2003 to 2017, it increased significantly by an average of 0.59 points per year (coefficient of the linear trend function $b = 0.5875$, $p = 0.0412$) and only once fell below 70 points, exceeding 80 points on three occasions.

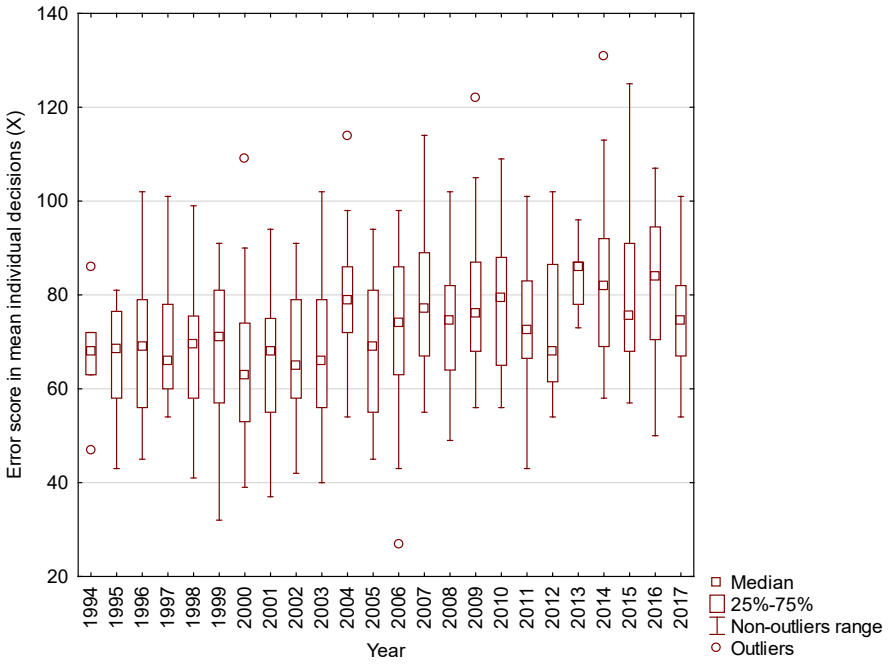


Figure 2. Annual distributions of individual error scores (Xi) from 1994 to 2017

The same analysis was carried for all other distributions of error scores (best individual, worst individual, autocratic, consultative and group). All of them showed the same pattern in time: no tendency in 1994–2003 and increasing tendency in 2003–2017. It was also examined if the distance between median error scores is stable over time. Figure 3 depicts the differences between median error score in autocratic and consultative decisions over time and between median group and autocratic decisions. No tendency is observed for these differences as well as the distances between them are stable over time. Therefore it can be concluded that despite the fact that median error score has been significantly increasing for the decision types after year 2003, there were no changes in the rank of the errors among different types of decisions.

The research participants included postgraduate students of four different programmes. The distributions of scores of individual students by study programme are shown in Figure 4 (left side). The differences in the distributions were significant (Kruskal–Wallis ANOVA $p < 0.0001$), and post-hoc tests were used to identify differing pairs.

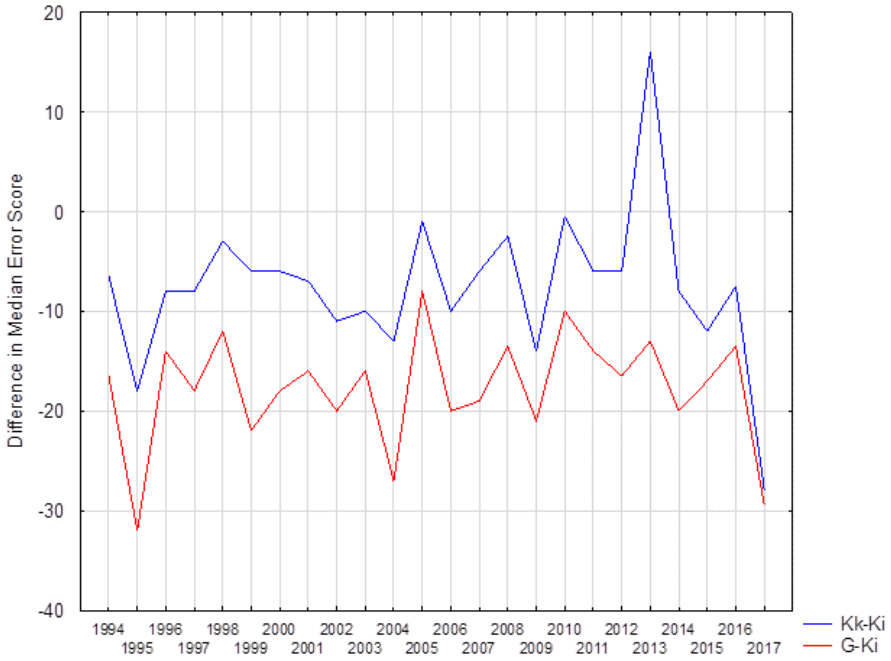


Figure 3. The differences in median score error between consultative and autocratic decisions and between group and autocratic decisions over the years 1994 to 2017

The median of the averaged individual error scores for ZPL – Healthcare Management (78.5) was significantly higher than the others, and the median for the MBA programme (55) was significantly lower. The medians for PSM – Postgraduate Managerial Studies (70) and HR (74) were not significantly different from each other.

Compared to the other participants, MBA students are more likely to hold higher managerial positions and have experience in various decision-making styles, and the lower individual error scores are therefore not surprising. However, the differences between the group decisions and the means of the individual decisions (Figure 4, right side), which illustrate improvement in decision quality, were not significantly different between the different postgraduate programmes (Kruskal–Wallis ANOVA $p = 0.1047$), and there were also no significant differences between the programmes in the improvements from individual decision-making to consultative decision-making (not shown; Kruskal–Wallis ANOVA $p = 0.1194$).

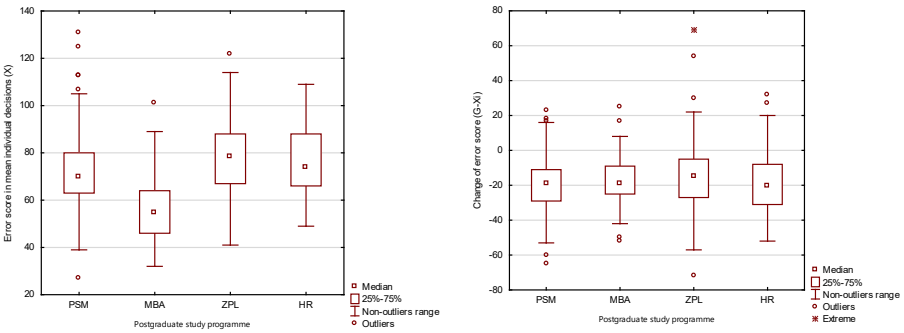


Figure 4. Distribution of results by study programme —individual decisions (Xi; left) and the change from individual to group decisions (G – Xi; right)

Subsequent analyses were for all programmes of postgraduate studies combined.

H1: A team leader who uses team members' direct participation for complex and multi-stage problems increases the probability of a higher quality decision than when making a decision autocratically.

Significant increases in the quality of decisions were achieved by switching from autocratic to consultative (+10.2%) and then to group decision-making (+15.3%); the overall improvement from autocratic to group decisions was also significant (+23.9%) (Table 3).

Table 3. Error scores for different decision-making styles

	Error score (mean)	Standard deviation	Error score (median)
Autocratic decision (Ki)	71.7	25.7	70
Consultative decision (Kk)	64.4	24.1	62
Group decision (G)	54.5	21.6	50

The positive effects of the PDM process are also supported by the structure of the team results. The proportion of teams whose quality of decision-making improved (i.e., lower error scores) ranged from 60% to 76% (Table 4), depending on which decision-making style is used as the starting point for the comparison. Only 21–31% of the teams saw poorer decisions.

Table 4. Effects on decision quality of changing the decision-making style

Change in decision-making style	Number of teams			Percentage of teams		
	Better	Same	Worse	Better	Same	Worse
From autocratic (Ki) to consultative (Kk)	359	51	187	60%	9%	31%
From consultative (Kk) to group (G)	408	36	154	68%	6%	26%
From autocratic (Ki) to group (G)	452	20	125	76%	3%	21%

In summary, the results show that a change in the decision-making style toward greater team members' participation led to lower error scores, and therefore H1 is supported.

H2: A team leader who uses team members' direct participation for complex and multi-stage problems increases the probability of a higher quality decision than the average of the individual members of a group.

H3: A team leader who uses team members' direct participation for complex and multi-stage problems increases the probability of a higher quality decision than the best individual decision from among the team members.

Next two hypotheses concern potential synergy that can be achieved through participation in decision-making. Weak synergy (H2) and strong synergy (H3) values were calculated for both consultative and group decision-making, generating four variables describing the level of synergy (Table 5). These variables are not normally distributed.

Table 5. The value of synergy in various decision-making styles

Synergy	Decision-making style	Formula	Result	Percentage change
Weak cognitive synergy	Consultative	Mean (Xi) – Mean (Kk)	8.3	11.4%
	Group	Mean (Xi) – Mean (G)	18.3	25.2%
Strong cognitive synergy	Consultative	Mean (I min) – Mean (Kk)	−14.6	−29.3%
	Group	Mean (I min) – Mean (G)	−4.6	−9.2%

Consultative and group decisions achieved weak synergy – lower error scores than the average individual errors in the team – reducing the error values by 11% and 25%, respectively. Consultative decisions achieved better decisions than the average of the individual decisions in 71% of the teams, and group decisions were better in 88% of the teams (Figure 5). Both decision-making styles, however, produced worse results than the best individual in the

team – in other words, there was no strong synergy. It is worth noting that, through group decision-making, the teams came closer to the level achieved by the best team member. The best team members were, on average, 9% better than the group decisions, but it should also be noted that consultative decisions produced better scores than the best individuals in 19% of teams, and group decisions in 37% of teams (Figure 5).

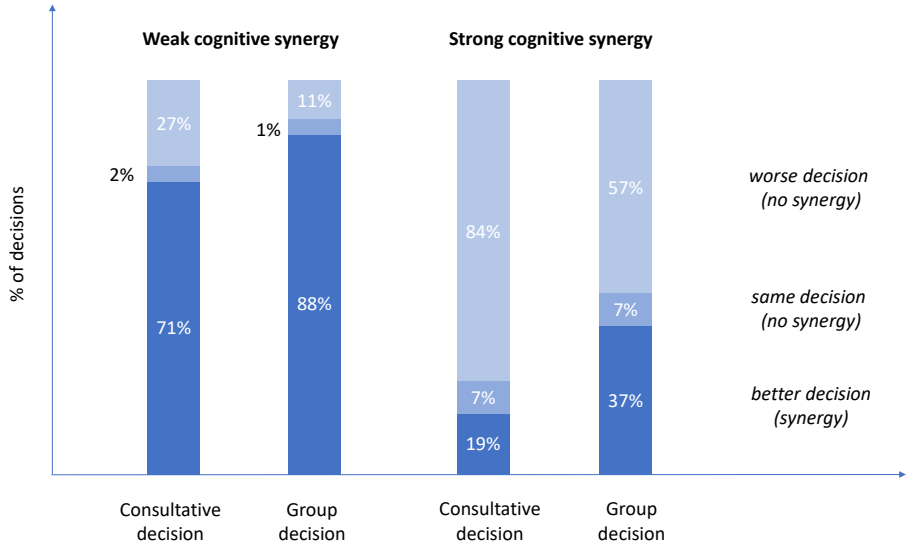


Figure 5. Frequency of weak and strong cognitive synergy in teams

An additional analysis was conducted to determine whether PDM led to similar improvements in the scores of the strongest and weakest teams. Did the weakest teams improve the quality of their decisions to a similar degree as the strongest teams thanks to participation?

For this purpose, we identified two groups:

1) The best teams, defined as those in which the mean scores of the team members (Xi) were less than 57.4 (i.e., the error score was at least 20% lower than the average for the entire sample). The number of such teams was 103 (17.2% of the sample).
2) The weakest teams, defined as those in which the average scores of the team members (Xi) were greater than 86.0 (i.e., the error score was at least 20% higher than the average for the entire sample). The number of such teams was 113 (18.9% of the sample).

The results indicate that, regardless of the competences of the team members as measured by individual scores, decision quality improved as a result of participation in the decision-making process. The nominal value of weak synergy was slightly lower among the best teams (5.6 vs. 9.3 for consultative decisions, 13.9 vs. 17.9 for group decisions), but it should be kept in mind that improving a good initial decision is more difficult than improving a poor decision. Analyzing strong synergy, it was noted that group decision-making among the best teams (36.5) achieved scores very similar to the best individual scores in those groups (33.8). Strong synergy was worse among the weakest teams (Table 6).

Table 6. Comparisons of strongest and weakest teams

Parameter	All teams N = 598	Best teams N = 103	Weakest teams N = 113
Average of mean scores of individual team members (Xi)	72.7	50.4	95.6
Average of best scores of individual team members (I min)	49.8	33.8	70.7
Average of autocratic decision scores (Ki)	71.7	50.3	94.5
Average of consultative decision scores (Kk)	64.4	44.8	86.3
Average of group decision scores (G)	54.4	36.5	77.7
Weak cognitive synergy: consultative (Xi – Kk)	8.3	5.6	9.3
Weak cognitive synergy: group (Xi – G)	18.3	13.9	17.9
Strong cognitive synergy: consultative (I min – Kk)	-14.6	-11.1	-15.6
Strong cognitive synergy: group (I min – G)	-4.6	-2.8	-7.0

In summary, these results lead to the following conclusions:

- Hypothesis 2 is supported.
- Hypothesis 3 is rejected.

DISCUSSION

Participatory vs. Autocratic decision-making

The quality of decisions was improved by the leader consulting with team members in more than half of the teams (60%), and even more (76%) benefited from increasing participation by using group decision-making. A similar benefit from changing from autocratic to group decision-making was found by Lafferty and Eady (Mączyński, 1996); however, increasing participation is

not a guarantee of better decisions, as poorer decision-making occurred in a small number of cases.

The study answered the question of whether the use of a consultative style mean a significant difference, enabling a decision similar to a group decision, or will it rather be closer to an autocratic decision. The quality of consultative decisions was roughly in the middle of autocratic and group decisions.

It is worth mentioning that a small number of leaders kept their original individual decisions even after consulting with their teams (9%), meaning that a relatively small proportion were "resistant" to the arguments of their team members. In such cases, institutionally forced consultation would simply be a sham.

Cognitive synergy in decision-making processes

The decision-making styles were assessed relative to the average individual result and the best individual result for each team. Consultative decision-making reduced error scores by 11% from the average individual scores, and group decision-making by 25%; weak cognitive synergy was also observed. No previous studies examining consultative decision-making were found, but the findings for group decision-making are similar to those found in the literature; for example, Hamada et al. (2020) found an improvement of 22%, and Hodder (2001) found improvements ranging from 26% to 44%, depending on team size. The analysis of the distribution of results confirms the positive effect of PDM processes in the majority of the teams, with consultations reducing errors in 71% of teams and group decision-making reducing errors in 88%.

Adopting the best individual decision in the team as the benchmark for assessing the consultative and group decisions raises the bar significantly. Both decision-making styles were worse than this benchmark, and strong cognitive synergy was not observed. Compared to the best team members, consultative decisions were 29% worse and group decisions 9% worse, but while the first of these differences is significant, the group decisions were approaching those of the best team members.

The distribution of results shows that, in 19% of the teams, the consultative decision was better than the decision of the best team member, and this almost doubled for group decisions to 37%. In a similar study by Rogelberg et al. (1992), the percentage for group decisions was 13%, while for a modified decision-making style that induced all participants to participate actively in the process, it increased to 56%. However, it should be emphasized that, in the current experiment, about half of the teams (57%) still made poorer decisions than the best team member, which may be a result of

underestimating the best solutions that emerged from the individual team members during Stage 1 and then working on a worse, compromise solution.

However, it should be emphasized that the teams were solving a new problem that they had not dealt with before, so it would not be easy to assess which team member had proposed the best solution. It can therefore be reasoned that, in a situation in which an assessment of the team members' proposals is difficult, group decision-making would permit a decision that may be worse than, but is nevertheless close to, the proposal of the best team member. As a result, the risk of making a very poor decision is minimized.

In summary, the use of the knowledge of team members enables the creation of synergy, which is manifested in the development of a decision that is better than the average performance of the team members (weak cognitive synergy) and sometimes better even than the best individual decision in the team (strong cognitive synergy). This effect was independent of the competences of the team members, as measured by the individual results in Stage 1 of the experiment and confirmed by the comparison of the strongest and weakest teams and of teams studying different postgraduate programmes.

Managerial implication

Decision-making skills are essential for any team leader, the right choice of the decision-making style increases the chances of making the right decision. Researchers point out many determinants of the choice of the decision-making style, e.g., decision problem nature (Davenport, 2011), national and corporate culture (Hammoud, 2011), manager's knowledge and experience (Kozioł-Nadolna & Beyer, 2021), personality (Selart, 2005; Belhekar, 2017), age and gender (Lizárraga et al., 2007), attitude and competence of team members (Leana, 1986).

Nowadays leaders are often expected to deal with multiple tasks or projects simultaneously, so many decisions are taken under time pressure (Ordóñez et al., 2015). In particular, time pressure has been shown to lead people to complete the most pressing task to the exclusion of others (Leroy, 2009) which may induce them to choose one-person decisions, as this do not require more time than necessary to involve additional people in the decision-making process.

In the case of routine, repetitive problems, such an approach might be justified. However, in times referred to by the acronym VUCA (Bennis & Nanus, 1985), more and more decision-making problems are new, complex and multi-stage. In such a case, it is necessary to develop creative and innovative decisions, which is not conducive to autocratic decisions.

Such decision problems were the subject of the experiment in the study described in the article. This research suggests that increasing team members' participation to a consultative role and even better, a full participatory role, increases the quality of such decisions. It is also worth remembering that such decision-making styles provide people with opportunities to have a personal impact on companies, which is particularly important for new generations entering the labor market (Ng et al., 2010). An additional benefit is increased management transparency (Okaka et al., 2023). However, it is worth noting that group decisions do not guarantee a higher quality of solutions. Lower-quality decisions can occur, and there is thus a need to build a culture of accepting risk in the case of new, innovative ventures.

Facing a new, complex, multi-stage decision-making problem, leaders have a consultative and group style at their disposal. The group decision-making style can bring better quality, but it has its limitations and it is not always possible to use it. It requires a team of highly competent members who identify themselves with the interests of the organization. Otherwise, the consultative form will bring better results.

CONCLUSION

The aim of this long-term experiment was to determine the effect on decision quality of changing the form of direct participation in the decision-making process in the case of complex and multi-stage problems. The authors thus sought to identify the scale of potential opportunities and threats resulting from different forms of team members' participation.

The results of the experiment confirm the significant synergistic potential of increasing direct PDM processes for complex, non-routine problems, with scores improving with increased participation. A significant proportion of teams made better decisions as a result of increasing direct participation – replacing autocratic decisions with group decisions. The quality of consultative decisions was roughly in the middle of autocratic and group decisions. This effect was universal, observed both in the strongest and weakest teams.

On the other hand, in most cases the group made worse decisions than the best individual, which confirms the results of previous research (Bonner et al., 2004). Although the quality of group decisions was lower than that of the best team member, compared to other decision styles, it was close to the best team member. Our study shows that group decision-making markedly reduced the risk of making highly misguided decisions, and it can

be reasoned that direct participation protects against serious mistakes more than it guarantees the best possible results.

Using the synergistic potential of PDM requires a number of prerequisites (Anderson et al., 2001), particularly those related to organizational culture, competences, and the attitudes of team leaders and team members. The adoption of group decision-making also requires a superior's trust in the competences of the participants in the decision-making process, the community of their interests, and the credibility of their stated intentions. When trust is limited only to competence, a supervisor should lean toward less effective but safer consultative decision-making.

Traditional teams participated in the study, but to some extent the results of the experiment are relevant to decision-making processes in virtual teams. It seems that the increase in the quality of decisions as a result of the use of the consultative style may also occur in such circumstances. Some limitations may be associated with the group decision-making style results. Communication in virtual teams is associated with various limitations that may hinder the participation of all team members, e.g., lack of non-verbal communication, technical problems, and an unwillingness of some people to participate actively in online meetings (Klonek et al., 2021; Yang et al., 2021). As a result, a group decision may be the result of the actions of some team members and not bring synergy that occurs in traditional teams.

These results are consistent with experiments that used scenarios in which teams had to make decisions in life-threatening situations. For the first time, an empirical study analyses the case of consultative decision-making, in which the team leader consults the individual opinions independently to finally come up with a final "team" decision. This approach is widely used by team leaders and managers in the field. The composition of the sample should also be emphasized: all were professionally active participants. The nature of the sample and its large size (598 teams, 2,673 participants) convey a great validity to the results of this study.

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Appendix: Sample calculations of error scores after the experiment

Task	Experts' decision	Autocratic decision		Consultative decision		Group decision	
	Ranking	Ranking	Error score	Ranking	Error score	Ranking	Error score
1. Selection of team members	12	16	4	9	3	16	4
2. Tracking the progress of the project	17	9	8	20	3	13	4
3. Identification and preparation of tasks' description	8	3	5	10	2	11	3
4. Development of variants of the project implementation	3	4	1	2	1	2	1
5. Preparation of the schedule	6	5	1	3	3	9	3
6. Correcting individual actions	20	15	5	14	6	19	1
7. Assigning tasks for team members	15	18	3	17	2	10	5
8. Setting the goals of the project	2	1	1	6	4	4	2
9. Team members training	13	20	7	15	2	14	1
10. Review and analysis of the situation in the area of the project	1	7	6	1	0	1	0
11. Defining the necessary competences in the team	10	6	4	13	3	6	4
12. Making changes to the project	19	17	2	12	7	18	1
13. Coordination of implementation activities	16	19	3	18	2	15	1
14. Defining the necessary resources (financial and material)	11	14	3	16	5	8	3
15. Assessment of team members performance	18	12	6	19	1	17	1
16. Evaluation of considered project's variants	4	2	2	7	3	3	1
17. Assessment of the consistency of team and individual goals	14	13	1	11	3	20	6
18. Identifying the decision-making powers needed for the team	9	8	1	5	4	12	3
19. Decision on how to implement the project	5	10	5	8	3	7	2
20. Determination of strategic control points	7	11	4	4	3	5	2
Total			**72**		**60**		**48**

Abstrakt

CEL: *Czy zespoły podejmują lepsze decyzje niż jednostki? Dotychczasowe badania przynoszą niejednoznaczne wyniki. Co więcej, partycypacja pracowników w podejmowaniu decyzji może przyjmować różne formy, nie ogranicza się jedynie do decyzji zespołowych. Tymczasem wpływ różnych form partycypacji pracowników w proces podejmowania decyzji był dotąd rzadziej analizowany. Celem niniejszego badania była identyfikacja wpływu wykorzystania różnych form bezpośredniej partycypacji w podejmowaniu decyzji na jej trafność w przypadku złożonych, wieloetapowych*

*problemów decyzyjnych. **METODYKA**: W artykule zaprezentowano wyniki eksperymentu, w którym wzięło udział 598 zespołów składających się łącznie z 2 673 osób. Uczestnicy trzykrotnie rozwiązywali problem decyzyjny wykorzystując autokratyczną, konsultatywną oraz zespołową formę podejmowania decyzji. Uczestnicy odgrywali rolę członków nowopowołanego zespołu, którego zadaniem było zaplanowanie prac w ramach nowego projektu. Problem decyzyjny był dla uczestników na tyle nowy, aby podczas jego rozwiązywania nie można było zastosować wprost znanych rozwiązań w całości lub części, wskazane było natomiast podejście kreatywne. Następnie rozwiązanie problemu było porównywane z optymalną decyzją wypracowaną wcześniej przez ekspertów. Różnica pomiędzy decyzjami była wyznacznikiem jakości decyzji. **WYNIKI**: Rezultaty eksperymentu potwierdzają potencjał synergiczny tkwiący w uspołecznianiu procesów decyzyjnych w przypadku złożonych, wieloetapowych problemów. Znacząca część zespołów wypracowała trafniejsze decyzje dzięki wzrostowi bezpośredniej partycypacji – zastępując autokratyczną decyzję kierownika decyzjami konsultatywnymi oraz zespołowymi. Dzięki wykorzystaniu tej ostatniej formy zespoły podejmowały trafniejsze decyzje niż przeciętny uczestnik zespołu oraz zbliżały się do decyzji podejmowanych przez najlepszego uczestnika zespołu. Uzyskany efekt był uniwersalny, występował zarówno w najsłabszych jak i najlepszych zespołach. Należy jednak pamiętać, że pomimo znacznego potencjału synergii, nie zawsze jest ona osiągana. Z drugiej strony, dzięki wykorzystaniu decyzji zespołowych znacząco ograniczone zostało ryzyko podjęcia wysoce nietrafionych decyzji, co oznacza, że taka forma partycypacji bezpośredniej bardziej chroni organizacje przed poważnymi błędami niż zapewnia podjęcie najlepszych decyzji. **IMPLIKACJE**: Ważnym elementem warsztatu menedżerskiego jest znajomość i umiejętność wykorzystywania różnych form podejmowania decyzji, w tym związanych z bezpośrednią partycypacją pracowniczą. Zaprezentowane badanie potwierdza zasadność zastosowania formy konsultatywnej i zespołowej w przypadku złożonych, wieloetapowych problemów decyzyjnych. Organizacje, które muszą sobie radzić z szybkim rozwojem technologii, coraz krótszymi cyklami życia produktów i wzrostem konkurencji, wymagają elastycznych struktur wykorzystujących partycypację pracowników na wszystkich szczeblach zarządzania. **ORYGINALNOŚĆ I WARTOŚĆ**: Uzyskane rezultaty potwierdzają wyniki dotychczasowych badań. Wartością dodaną badania jest uzupełnienie autokratycznej i zespołowej formy podejmowania decyzji stosowanej w podobnych eksperymentach o formę konsultatywną. Dodatkowo należy podkreślić wielkość próby badawczej, która jest wielokrotnie większa od prób wykorzystywanych dotychczas w podobnych badaniach. Co więcej, uczestnikami eksperymentu były osoby aktywne zawodowo, w przeciwieństwie do wielu podobnych badań, w których uczestniczyli studenci.*

Słowa kluczowe: *partycypacja pracownicza, zarządzanie partycypacyjne, podejmowanie decyzji, jakość decyzji, problemy decyzyjne, formy decydowania*

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Authorship contribution statement

Ryszard Rutka: Conceptualization of the Experiment, Conducting an Experiment, Review & Editing. **Piotr Wróbel:** Review of Previous Research, Writing – Original Draft. **Ewa Wycinka:** Statistical Analysis, Review & Editing. **Małgorzata Czerska:** Conceptualization of the Experiment, Conducting an Experiment.

Conflicts of interest

The authors declare no conflict of interest.

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