

Розроблено метод конфігурування команди проекту за критерієм суб'єктивного благополуччя. Метод спрямований на пошук такої конфігурації претендентів, за якої утворюється команда з найвищою спільністю щодо значимості цінностей (факторів) суб'єктивного благополуччя та фактичним їх задоволенням на момент формування команди. В основу методу покладено два концептуальних положення-аксіоми. По-перше, найбільш адекватні результати побудови персонального профілю досягаються в ході самодослідження ставлення претендента до індикаторів суб'єктивного благополуччя. По-друге, ранжирування дозволяє побудувати ряд, в якому найбільш важливими представлені найменш досягнуті індикатори.

На цій підставі представляється можливим порівнювати профілі претендентів між собою та виявляти найбільш схожі. Теоретично обґрунтовано, що конфігурація з найбільш близьких профілів є передумовою утворення позитивного робочого середовища як необхідного фактору комфортної взаємодії учасників команди, суттєвим інтегруючим фактором залучення до проекту. Розроблений метод побудови персонального профілю претендента забезпечує необхідну точність і підвищує достовірність одержуваної при цьому інформації. Емпірично виявлено дві «робочі зони» персонального профілю (перші п'ять та наступні сім з 27-ми індикаторів), визначальні для виявлення близьких профілів претендентів. Для порівняння профілів введено показники загального підсумкового рангу для індикаторів зон та коефіцієнт узгодженості команди.

Для інтерпретації значення коефіцієнта узгодженості емпіричним способом побудована оцінна шкала з сімох інтервальних зон для команд у складі від двох до десяти учасників. За результатами експериментальної перевірки доведена можливість використання критерію суб'єктивного благополуччя як параметра формування команд проектів, його дієвість та адекватність

Ключові слова: формування команди проекту, персональний профіль, суб'єктивне благополуччя, коефіцієнт узгодженості команди, оцінна шкала

UDC 005.83:005.953.2:316.45

DOI: 10.15587/1729-4061.2019.160651

METHOD FOR CONFIGURING THE COMPOSITION OF A PROJECT TEAM BASED ON THE CRITERIA OF SUBJECTIVE WELL-BEING

V. Rach

Doctor of Technical Sciences, Professor, Director of Educational-Scientific Institute of Information and Communication technologies**
E-mail: valentine.rach@i.ua

I. Osakwe

Postgraduate student*
E-mail: kennymdom2003@yahoo.com

O. Medvedieva

Doctor of Technical Sciences, Professor*
E-mail: agat.lg@i.ua

O. Rossoshanska

Doctor of Economic Sciences, Associate Professor
Luhansk State Academy of Culture and Arts
Tchigorina str., 20, Kyiv, Ukraine, 02000
E-mail: olga_rossoshanskay@i.ua

N. Borulko

Postgraduate student*
E-mail: natalie.borulko@gmail.com

*Department of Mathematical Methods and Statistics**
***"KROK" University

Tabirna str., 30-32, Kyiv, Ukraine, 03113

1. Introduction

The main mission in the formation of a project management team (hereinafter referred to as "team") is reduced to the choice of "right" people from many candidates. Only thanks to this, a team will be able to work effectively as a well-coordinated, self-organizing system, thereby making a significant contribution to the success of a project under conditions of high uncertainty and turbulence. Analysis of multiple characteristics of an effective team [1, 2] suggests that the degree of its effectiveness is directly proportional to activity and intensity of the demonstration by its members of the competencies of project managers (engineering, contextual and, especially, behavioral [3]). It is common to consider subjective well-being of team participants caused by the positive working atmosphere as one of the key factors of such activity and intensity [4]. Most often, subjective well-being implies a comprehensive measure of individual

happiness, which takes into consideration not only economic aspects, but also non-economic ones [5]. The latter imply equal positive relationships and trust among team members, effective working communications, sense of belonging to the whole (team, project, and organization), sense of psychological security. At the same time, subjective well-being acts as a factor of creation of a positive working atmosphere in a team. According to the research [6, 7], it is a value structure of consciousness of its participants, has a distinct focus on their value preferences. Commonness of team members by their value preferences of subjective well-being stands as the single basis, on which positive working atmosphere relies and by which it is maintained. In this context, it is appropriate to use subjective well-being as the criterion of "rightness" of candidates in formation of project teams. This is especially significant for the teams of international projects in view of multi-culture and diversity of worldviews and "backgrounds" of their participants. Subjective well-being

in them acts as an integral indicator of value orientation, reflexing over cultural and mental differences. At the same time, in some societies, the parameter of subjective well-being is regarded as a system-forming personality value. Based on empirical experience, such societies include the countries in Africa.

Today, parameters of subjective well-being are widely used for evaluating the performance of separate project managers, project leaders [4], as well as project teams in general [8, 9]. Despite this, the issues related to the development of the system of indicators, evaluation scales, procedures for evaluating and selecting candidates to a team by this criterion remain unresolved.

This demonstrates the relevance of the research aimed at the development and experimental verification of the efficiency of approaches to constructing individual profiles of candidates based on the indicators of subjective well-being [10] and the formation of project teams according to the criterion of coherence of these profiles [11].

2. Literature review and problem statement

Research into issues related to the formation of project teams has always been, and remains, relevant regardless of the spheres of activity. For example, in the space sphere, special attention is paid to the ability of members to establish and maintain interpersonal relationships [12]. NASA funds the entire research direction “The risk of the efficiency and mental (behavioral) deterioration due to inadequate cooperation, coordination, communication and psychosocial adaptation in a team”. Within such research, all the means, both terrestrial and within a spacecraft, which maintain proper psychosocial state of members of already formed teams, are studied in detail. However, the procedures of the evaluation and selection of candidates for space projects are described in open sources only in general terms.

It is emphasized in paper [12] that it will take years to see the first significant results towards the development of a standard set of methods for measuring, especially oriented to psychological and team factors. This situation also applies to all other spheres of activity. That is why the issue of the development of an effective method for selection of project management team members is even more important than it might be for one particular industry.

The scientific literature uses different terms in the formulation of activities for team building: selection, composition, formation, design. Usually, such studies as [12] only enumerate a series of personal characteristics (including technical, communication, and holistic) that are desirable for a candidate to a project team. However, detailed descriptions of the algorithm for selection, translation of verbal descriptive characteristics into some numeric forms for future comparison, the application of measurement and comparison scale as most important but are virtually not found in literature.

Thus, in paper [13], 47 attributes required for an effective project manager were analyzed, their ranking by their importance for males and females was explored with a view to identifying gender differences in the perception of competences. For most projects, the central issue is how to use the importance of indicators for separate individuals to determine their future compatibility for working in a team. The study [13] also uses the concept of constructing a per-

sonal profile for candidates, however, such a profile consists only of formal attributes (age, sex, education, nominal education, work experience, etc.), without capturing individual personal preferences that affect the perception of the world in general.

Other studies, such as [14], analyze the impact the nature of the team development and availability of external intervention on its effectiveness, using so-called “a group development questionnaire”. The tool developed in [14] is of interest to study maturity of already formed teams but is not applicable without significant modifications for the task of selecting compatible team members. The studied sample acts as a meaningful limitation of work [14]. The study participants were selected exclusively among the employees of the Swedish public sector. It does not allow extension of the obtained knowledge to other spheres of activity without their experimental verification.

Article [15] describes a ready toolset for scanning the information about the candidate in the form of a check-list template. The template contains three categories: knowledge, practical experience, features of character. The section “knowledge” is divided into three types: general management, project management, subject area (industry). This division corresponds to widely used approaches concerning the classification of competences. Paper [15] does not contain any comparison of the profiles of candidates, transfer of verbal data of check-lists to numeric data using relevant scales. However, the practice needs not only algorithms of descriptions of candidates, but also their comparison and selection based on the compatibility parameters for further work in a project.

Similarly to paper [13], article [16] examines the attributes inherent of whole cultures. Three cultural groups were separated: multi-active, reactive, and linear-active. In the contemporary context of rapid globalization, international projects become an everyday reality. Accordingly, the interaction of stakeholders from different ethnic background really requires a certain universal uniting marker in the process of the project team formation. Attempts to measure and take into consideration the ability of an individual to adapt to multicultural environment are made by introducing the concept of Cultural Intelligence [16]. In this approach, the identity is assigned the Cultural Quotient (CQ). The higher the CQ, the better adaptability to cultural diversity. However, paper [16] contains no information about how to configure a team by cultural coefficient. The feasibility of “labeling” whole nations in the form of one of the three possible characteristics (multi-active/reactive/linear-active) seems disputable.

While there are enough descriptive techniques, experimental verifications of selective methods are found in the literature more rarely. That is why papers [17, 18], in which the method of selection of teachers for the educational program is based on the social judgment theory, are of particular interest. Six psychological models: Extraversion, Agreeableness, Conscientiousness, Resilience, Self-regulation, and Cognitive Ability are applied as personality attributes in them. When separating candidates into clusters, the people expressing social opinion regarding the candidates used different attributes of the six possible as the leading ones for three different clusters. In the application of such a method of selection, the goal is to get the answer to the question how likely is it that a candidate will succeed in the teaching profession. It is not enough for a project team. In a project,

it is important to know that selected members of a team will succeed in working together.

It is noted in study [18] that “... team members with different personalities are unlikely to follow strict rules to regulate their behavior ... but it is not worse for the effectiveness of the whole team, if it is dysfunctional in general”. This statement confirms the relevance of our intention to put forward the criterion of subjective well-being as a unifying parameter to identify those candidates who have common value preferences.

Such methods are developed to create more effective, efficient, and comfortable project teams. Paper [19] analyzes the factors influencing the efficiency of teams. Such studies, though not focused on selective methods, are a valuable source of information about the factors that support the unity of team members. Thus, paper [19] studied inter-institutional research teams, consisting of representatives of academic circles. Three studied factors presumably influencing the team productivity were separated: Knowledge-sharing, Team conflict, Emotional intelligence. Paper [19] contains the most valuable material about which mathematical tools and software products were used for processing experimental data. However, there is no information on how teams were formed, and how candidates were selected. In paper [19], the selection was limited merely to representatives of one sphere of activity (education), albeit with international participants. From the conclusions reached by the authors of [19], it follows that:

- on the one hand, emotional intelligence directly affects both the ability to disseminate knowledge among participants of joint projects, and conflict management;

- on the other hand, in the educational environment emotional intelligence by itself does not affect the performance of teams. This relates to that the representatives of academic circles are “educated people with a high socio-economic status and self-identity, ... who can manage and appropriately express their emotions”. That is why it should be borne in mind that “the elite of a society has certain dignity”. Teachers have “a sense of professional morals” and the desire “to bring benefits to teamwork”. Team members with higher social status easily managed their emotions, while subordinates sharply reduced the team performance due to the problems with knowledge exchange and team conflicts;

- emotional intelligence “was, however, both in direct and indirect aspects, a key factor in such structure of relationships in the work of the members of academic community”.

In paper [19] it was shown that belonging to the academic field served as the source of unity of the members of the studied teams. Therefore, the criterion of subjective well-being can be a really universal invariant criterion not dependent on social, economic, cultural, gender, age, and status belonging.

In sport, within some sporting disciplines, competitions are held in both in teams and among individuals. In team sports, athletes’ personal qualities will not be decisive in the absence of the team cohesion. Similar logic is the basis for the classification of available techniques of team building in article [20]. The need for the developments for compiling personal profiles of candidates and for the formed teams was shown. In addition, it focuses on the analysis of already formed teams, but not at the stage of their formation.

An analysis of sources [20–22] makes it possible to draw a conclusion about the existence of two key selective approaches to team formation.

The first approach (“element”) is aimed at identifying if a candidate meets the assigned reference values of the indicators. This method of selection involves a clearly determined reference model, procedures for measuring indicator values of a candidate, comparing them with reference values. The candidates with the highest scores are selected to the team. A typical example of this approach is outlined in [21].

The second approach (“holistic”) also involves the use of a reference model. However, the obtained estimates of candidates are used for the search for the most rational configuration of a team as a holistic system. Under this approach, the concept of a complementary team is used as a key concept [22].

It is possible to identify two shortcomings that are common for these approaches. The approaches do not imply the comparison between profiles that are based on studies of self-attitude [23], that is, by a candidate himself. In addition, they do not imply a procedure for assessing the integrity of a team, when the profiles of all candidates are selected in turn as a reference profile. There have been found no studies, in which similar problems would be raised and solved in the context of the project team formation. The closest in this sense are the methods proposed in studies [24] and [25]. Thus, in paper [24], the team formation method is based on the selection of potential candidates based on the professional experience of completed works and their further ranking relative to the model of the “ideal” executor of this work. The provisions of the research were not used in [24], the method for final decision making about the choice of a candidate was not detailed. Paper [25] addressed the issues of formation of soft (educational) projects based on the ranking by the participants of the competences formed in a project as indicators of their values. To do this, the author used the concept of the function of presence developed in [26]. However, under this approach, another problem was solved – the transformation of participants’ profiles in the form of ranked series into work packages and project works. This is significantly different from the problem of identifying the rational team configuration.

Based on the foregoing, it can be argued that the insufficiently developed methods for the formation of project teams, focused on taking into account of “soft” team factors, necessitates further research in this direction. The studies of the formation of project teams according to the criterion of subjective well-being as the most invariant indicator of “softness” can be considered preferable.

3. The aim and objectives of the study

The aim of this study is to develop the method for configuring the composition of a project team based on personal profiles of candidates by the criterion of subjective well-being.

To accomplish the aim, the following tasks have been set:

- to develop the method for the construction of the personal profile of a candidate based on the results of ranking the indicators of subjective well-being;

- to develop the method for determining the coherence of personal profiles of candidates by pair-wise comparison;

- to develop the method for calculating the integral indicator of the results of pair-wise comparison of personal profiles;

- to develop the evaluation scale and the method for evaluation of coherence (commonness) of personal profiles of candidates;

- to carry out the experimental verification of the method.

4. Stages in the development of ae method for project team formation based on the criterion of subjective well-being

The developed method is based on the provisions of the verbal analysis of decisions [27]. The merits of this method are the possibility to collect the original data from the candidates to a project team in the verbal form that is customary for them, to check if they are contradictory and, if necessary, to have them corrected by a candidate. In this case, the data are fixed as a ranked series, the importance, or the priority of the elements of a series is determined by a candidate himself. Unlike the existing methods for verbal analysis, the author's approach involves the application of the systematic quartile models for obtaining and processing the original data [28]. This model was successfully applied in different systematic studies. The procedure of the formation of systematic models in the context of our research was described in more detail in paper [11].

4. 1. Method for constructing the personal profile of a candidate based on the results of ranking the indicators of subjective well-being

The starting point of the method for the construction of candidates' personal profiles is the collection of original data from candidate h ($\{1, 2, \dots, h, \dots, q\}$) in the form of his preferences regarding the indicators of subjective well-being. A candidate is asked to choose one ${}^i A$ model from a set of systematic quartile models $\{{}^1 A, {}^2 A, \dots, {}^i A, \dots, {}^n A\}$ (Fig. 1, *a*). Systematic models contain the same number of basic indicators of subjective well-being S ($S = \{1, 2, \dots, s\}$), to each of which the basic number a_l ($\{a_1, a_2, \dots, a_1, \dots, a_s\} | l \in S$) is assigned. The models differ in the content context and the way the basic indicators inside the model between its elements are grouped.

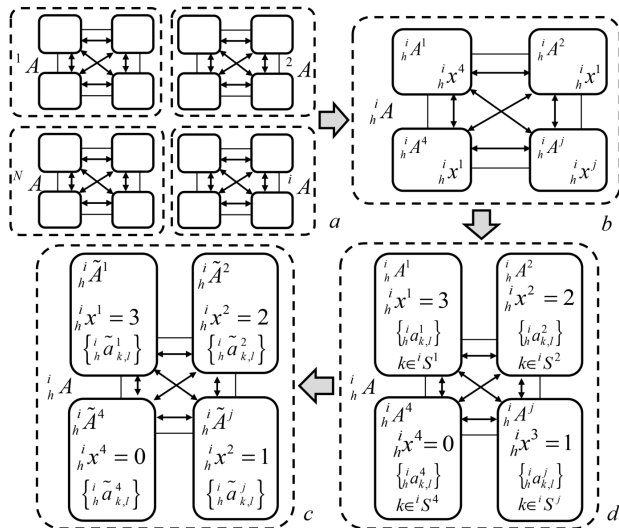


Fig. 1. Stages in identification of candidate's preferences regarding the indicators of subjective well-being: *a* – set of systematic quartile models; *b* – the most preferable model for h candidate; *c* – ranking of the elements of the most preferable model; *d* – ranking of the indicators of subjective well-being within the elements of the selected model

After choosing the system model that is most preferable for h candidate, the lower left index ${}^i A$, the value of which corresponds to the ordinal number of a candidate, in added

to its designation. Within the framework of the selected model, a candidate is invited to analyze the essence of each of ${}^i A^j$ of its elements and to rank them from the least important (assigning rank “4”) to the most important (assigning rank “1”) (Fig. 1, *b*). These ranks are marked by symbols ${}^i x^j$, in this case, the value of the top-right symbol j coincides with the value of the rank. In order to avoid confusion as to the importance of the elements of the model, the procedure for re-assignment of the values of the top-right index of the elements of model ${}^i A^j$. The values of rank ${}^i x^j$ are assigned to it (Fig. 1, *c*).

Every element of model ${}^i A^j$ has its own set of indicators of subjective well-being $\{{}^i a_{k,l}^j\}$, the number of which is assigned by array $\{{}^i s^j\}$. The task of a candidate at this stage is to rank separately the assigned lists of basic indicators within each element of the model. To do it, he is offered the procedure of mini-max ranking, the essence of which if reduced to the following:

1. The applicant is invited to determine the least important indicator for him from the whole totality ${}^i s^j$ of indicators of ${}^i A^j$ element. In the ranked series, this indicator will take the last place and will receive the highest rank ${}^i s^j$:

$${}^i \tilde{a}_{i^j-1,l}^j = \min \left\{ \dots, {}^i a_{k,l}^j, \dots \right\} \rightarrow \left\{ \dots, \dots, {}^i \tilde{a}_{i^j-1,l}^j \right\}$$

(${}^i s^j - 1$) indicators ranked series

2. The selected indicator is removed from the original list, which already consists of $({}^i s^j - 1)$ indicators. Then a candidate is invited to determine the indicator from this list that is most important for him. In the ranked series, this indicator will take the first place and it will be assigned the first rank:

$${}^i \tilde{a}_{1,l}^j = \min \left\{ \dots, {}^i a_{k,l}^j, \dots \right\} \rightarrow \left\{ {}^i \tilde{a}_{1,l}^j, \dots, \dots, {}^i \tilde{a}_{i^j-1,l}^j \right\}$$

(${}^i s^j - 1$) indicators ranked series

3. Next, the procedure is repeated. Another indicator chosen at the previous step is removed from the list. Now the list consists of $({}^i s^j - 2)$ indicators. The procedure of alternating selection of the least important, then of the most important indicator is carried out from constantly shortened list of indicators until a complete transfer of all indicators in the ranked series:

$${}^i \tilde{a}_{i^j-2,l}^j = \min \left\{ \dots, {}^i a_{k,l}^j, \dots \right\} \rightarrow \left\{ {}^i \tilde{a}_{1,l}^j, \dots, {}^i \tilde{a}_{i^j-2,l}^j, \dots, {}^i \tilde{a}_{i^j-1,l}^j \right\}$$

(${}^i s^j - 2$) indicators ranked series

$${}^i \tilde{a}_{2,l}^j = \min \left\{ \dots, {}^i a_{k,l}^j, \dots \right\} \rightarrow \left\{ {}^i \tilde{a}_{1,l}^j, {}^i \tilde{a}_{2,l}^j, \dots, {}^i \tilde{a}_{i^j-2,l}^j, {}^i \tilde{a}_{i^j-1,l}^j \right\}$$

(${}^i s^j - 3$) indicators ranked series

As a result, the ranked series $\{ {}^i \tilde{a}_{1,l}^j, {}^i \tilde{a}_{2,l}^j, \dots, {}^i \tilde{a}_{i^j-2,l}^j, {}^i \tilde{a}_{i^j-1,l}^j, {}^i \tilde{a}_{i^j-1,l}^j \}$, is formed, in which ${}^i \tilde{a}_{1,l}^j$ is the most important, and ${}^i \tilde{a}_{i^j-1,l}^j$ is the least important indicator for the candidate in ${}^i A^j$ element of the model. A candidate repeats the described procedure as many times as there are elements in the systematic model. In this case, for the chosen model, the procedure is repeated four times according to the number of elements in a quartile model.

The result of implementing the procedure for collecting data from candidate h about his preferences regarding the indicators of subjective well-being is the table of original data for constructing the profile of a candidate (Table 1).

Table 1

Original data on candidate's preferences

No. of the rank of an indicator in the elements of the model	Elements of system ${}^i_h\tilde{A}^j$, arranged in descending order of importance			
	${}^i_h\tilde{A}^1$ (${}^i_hx^1=1$)	${}^i_h\tilde{A}^2$ (${}^i_hx^2=2$)	${}^i_h\tilde{A}^3$ (${}^i_hx^3=3$)	${}^i_h\tilde{A}^4$ (${}^i_hx^4=4$)
1	${}^i_h\tilde{a}^1_{1j}$	${}^i_h\tilde{a}^2_{1j}$	${}^i_h\tilde{a}^3_{1j}$	${}^i_h\tilde{a}^4_{1j}$
2	${}^i_h\tilde{a}^1_{2j}$	${}^i_h\tilde{a}^2_{2j}$	${}^i_h\tilde{a}^3_{2j}$	${}^i_h\tilde{a}^4_{2j}$
...
${}^i_h\tilde{w}^j$	...	...	...	...
...	${}^i_h\tilde{a}^1_{s^1-1j}$	${}^i_h\tilde{a}^2_{s^2-1j}$	${}^i_h\tilde{a}^3_{s^3-1j}$	${}^i_h\tilde{a}^4_{s^4-1j}$
${}^i_s^j$	${}^i_h\tilde{a}^1_{s^1j}$	${}^i_h\tilde{a}^2_{s^2j}$	${}^i_h\tilde{a}^3_{s^3j}$	${}^i_h\tilde{a}^4_{s^4j}$

Each of the columns of the indicators of elements of system ${}^i_h\tilde{A}^j$ is a ranked list that is actually presented in the ordinal scale. This scale also permits, in addition to the procedures for computation and comparison of sizes of categories (in our case – ranked lists of indicators of the elements of system ${}^i_h\tilde{A}^j$), to form judgements like “more than” and “less than”. We will use the last procedure to build the profile of a candidate in the form of a single list of basic indicators of subjective well-being, in which indicators are listed in order of descending of importance for a candidate. The original lists are presented in Table 1. In order to integrate them into a single list, taking into account the importance of the elements of a model, we will introduce the following rule of integration: *indicators of element ${}^i_h\tilde{A}^{j+1}$ are integrated in turn in the orderly series of element ${}^i_h\tilde{A}^j$, beginning with number k. That is, indicator ${}^i_h\tilde{a}^{j+1}_{k,l}$ stands in the series after indicator ${}^i_h\tilde{a}^j_{k,l}$, and indicator ${}^i_h\tilde{a}^{j+1}_{2,l}$ – after indicator ${}^i_h\tilde{a}^j_{k+1,l}$.*

The rule is based on the assumption that the first indicator of the element of a model with a lower rank is less important than the indicator with number k , and more important than the indicator with number $k+1$ of indicators of the element of a model with a higher rank. Parameter W assigns the beginning of the zone of the list of indicators of a model with a higher rank of importance ${}^i_h\tilde{A}^{m-1}$, from which the integration of indicators from the list of the elements of the model with a lower rank ${}^i_h\tilde{A}^m$, begins.

The integration is implemented by the method of reverse motion (from the element with lower importance ${}^i_h\tilde{A}^m$ to the element with the higher importance ${}^i_h\tilde{A}^{m-1}$). Ordered indicators of element ${}^i_h\tilde{A}^m$ are integrated with similar indicators of element ${}^i_h\tilde{A}^{m-1}$. As a result, the intermediate orderly series of indicators from the elements of models ${}^i_h\tilde{A}^{m-1}$ and ${}^i_h\tilde{A}^m$ is formed. For this series, which consists of $({}^i_s^{m-1} + {}^i_s^m)$ indicators, the values of the importance rank for each of them is calculated as follows:

$${}^i_w^{m-1,m} = {}^i_w^{m-1} \cup {}^i_w^m, \tag{1}$$

$${}^i_w^{m-1} ({}^i_h\tilde{a}^{m-1}_{k,l}) = at (k \leq W, k); \text{ else } (2k - W), \tag{2}$$

$${}^i_w^m ({}^i_h\tilde{a}^m_{k,l}) = 2k + W - 1. \tag{3}$$

Then his intermediate orderly series is integrated with a series of indicators of element ${}^i_h\tilde{A}^{m-2}$ according to the rule described above. This procedure is repeated until the

indicators of the most important for a candidate element of system ${}^i_h\tilde{A}^1$ are integrated. The visually described procedure is shown in Table 2.

Table 2

Formation of individual rating set of indicators

No. of the rank of importance of indicator in the candidate's profile	Order of formation of the candidate's profile				Profile of candidate i_hA
	${}^i_h\tilde{A}^4$	${}^i_h\tilde{A}^3$	${}^i_h\tilde{A}^2$	${}^i_h\tilde{A}^1$	
1	–	–	–	${}^i_h\tilde{a}^1_{1j}$	${}^i_h\tilde{a}_{1j}$
2	–	–	–	${}^i_h\tilde{a}^1_{2j}$	${}^i_h\tilde{a}_{2j}$
...	–	–	–
k	–	–	–	${}^i_h\tilde{a}^1_{kj}$	${}^i_h\tilde{a}_{kj}$
$k+1$	–	–	–		${}^i_h\tilde{a}_{k+1j}$
$k+2$	–	–		${}^i_h\tilde{a}^1_{k+1j}$	${}^i_h\tilde{a}_{k+2j}$
$k+3$	–	–	${}^i_h\tilde{a}^2_{2j}$		${}^i_h\tilde{a}_{k+3j}$
...	–	–
...	–	–	${}^i_h\tilde{a}^2_{kj}$	...	...
...	–	${}^i_h\tilde{a}^3_{1j}$	...	...	...
...	–	...	...	${}^i_h\tilde{a}^1_{s^1j}$	...
...	–	...	${}^i_h\tilde{a}^2_{k+1j}$	–	...
${}^i_h\tilde{w}$	–	${}^i_h\tilde{a}^3_{2j}$	...	–	...
...	–	–	...
...	–	...	${}^i_h\tilde{a}^2_{s^2j}$	–	...
...	–	${}^i_h\tilde{a}^3_{kj}$	–	–	...
...	${}^i_h\tilde{a}^4_{1j}$		–	–	...
...		${}^i_h\tilde{a}^3_{k+1j}$	–	–	...
...	${}^i_h\tilde{a}^4_{2j}$	...	–	–	...
...	–	–	...
...	...	${}^i_h\tilde{a}^3_{s^3j}$	–	–	...
$s-1$	${}^i_h\tilde{a}^4_{s^4-1j}$	–	–	–	${}^i_h\tilde{a}_{s-1j}$
$s-2$	${}^i_h\tilde{a}^4_{s^4j}$	–	–	–	${}^i_h\tilde{a}_{sj}$

The last column of the table is the profile of candidate i_h , which consists of the ordered by him basic list of indicators of subjective well-being from the corresponding rank of importance from 1 to s . It should be noted that the profile of a candidate i_hA does not contain the information about what systematic model this profile was based on (there is no upper left index of the number of systematic model). The indicators of the profile of candidate ${}^i_h\tilde{a}_{k,l}$ do not contain this information either. That is why we will subsequently use indexes of candidates (lower left index) and rating k of the base indicator l (lower right indexes).

The procedure of uniting the lists using judgments like “more than” and “less than”, used during the integration, is actually a procedure of conversion of an ordinal scale into an interval scale [29]. During this procedure, there occurs the division of the distance between neighboring ranks, not represented explicitly in the ordinal scale. Due to this, the difference between new ranks decreases on average by two times. For such a scale, it is possible to perform an operation of conditional averaging (alignment) of distances

Table 3

Comparison of the profile of candidate ${}_hA$ with the profile of a project manager

No. of summing zone	Rank of basic indicator in the project manager's profile	Basic indicators of a project manager ${}_{hb}\tilde{a}_{k,lb}$	Rank of basic index of project indicator in candidate's profile ${}_h\tilde{a}_{v,lb}$	The difference by module between ranks $\Delta_{k,v} = |k - v|$	Data for generalized rank
Zone I, $z=2$	1	${}_{hb}\tilde{a}_{1,lb}$	$v(1,lb)$	$|1 - v(1,lb)|$	0 and $\max(1, v(1,lb))$
	2	${}_{hb}\tilde{a}_{2,lb}$	$v(2,lb)$	$|2 - v(2,lb)|$	0 and $\max(2, v(2,lb))$
	3	${}_{hb}\tilde{a}_{3,lb}$	$v(3,lb)$	$|3 - v(3,lb)|$	0 and $\max(3, v(3,lb))$
	4	${}_{hb}\tilde{a}_{4,lb}$	$v(4,lb)$	$|4 - v(4,lb)|$	0 and $\max(4, v(4,lb))$
	5	${}_{hb}\tilde{a}_{5,lb}$	$v(5,lb)$	$|5 - v(5,lb)|$	0 and $\max(5, v(5,lb))$
Overall total rank of zone I (equal to the sum of column 6)					${}_h\Delta_I$
Zone II, $z=3$	6	${}_{hb}\tilde{a}_{1,lb}$	$v(6,lb)$	$|6 - v(6,lb)|$	0 and $\max(6, v(6,lb))$

	13	${}_{hb}\tilde{a}_{13,lb}$	$v(13,lb)$	$|13 - v(13,lb)|$	0 and $\max(13, v(13,lb))$
Overall total rank of zone II (equal to the sum of column 6)					${}_h\Delta_{II}$
	14	${}_{hb}\tilde{a}_{14,lb}$	$v(14,lb)$		–
		–
	k	${}_{hb}\tilde{a}_{k,lb}$	$v(k,lb)$		–
		–
	$s - 1$	${}_{hb}\tilde{a}_{s-1,lb}$	$v(s - 1,lb)$		–
	s	${}_{hb}\tilde{a}_{s,lb}$	$v(s,lb)$		–

between ranks, thanks to which the ordinal scale will be converted into the interval scale. And this makes it possible to apply mathematical operations such as addition, subtraction, division, etc. to the ranks [30]. This assumption is justified by the fact that the mathematical and logical operations with quantitatively represented fuzzy data, used in the research, by their nature are classified as soft computations.

4. 2. Method for determining the coherence of candidates' personal profiles by their pair-wise comparison

The next step in the formation of a project management team by the criterion of subjective well-being is the procedure of comparison of candidates' profiles. To do this, the authors developed the method, based on the idea of calculating the overall total rank to evaluate the initial orientation of a candidate in the field of project management. Evaluation is carried out based on results of ranking by a candidate of 27 basic competencies according to their importance and influence on the result of the project implementation [31]. The calculation involves determining the sum of ratings by those competencies, the rating of which, specified by a candidate, differs from the basic (specified) rating by more than 9 positions. At summing, the higher value of rating between the basic one and the one selected by a candidate is selected. The value of the overall total rank, which proved that the tested candidate has the competence of starting susceptibility of a project manager, should be less than 130. According to our calculations, this makes up 23.2 % from the maximum theoretically possible value of the overall total ranking.

The proposed method for comparing profiles implies the similar comparison of the ratings of two candidates. In this case, the profile of the supposed project manager, to which index ${}_{hb}A$ is assigned, is chosen as basic. Table 3 shows an example of comparison of the profile of a candidate ${}_hA$ with the profile of a project manager.

In the table the rating of a candidate relative to the indicator of a project manager lb , which is equal to k , is designated as $v(k,lb)$ (Table 3, column 4). Analysis of the results of more than 400 options of calculations of the overall total rank showed the expediency to use not all the list from S indicators, but only 2 zones, in order to determine the coincidence degree. Zone I consists of the first five most significant indicators for candidate, and zone II of seven less significant indicators. The total of the number of indicators that are taken into consideration for determining the overall total rank is equal to half of all $S=27$ indicators (considering rounding to integer). At the same time, to increase the stringency of requirements to the magnitude of deviation of candidate's ranks from the manager's rank, in the first zone the permissible magnitude of deviation $z=2$, and in the second zone $z=3$.

Data for column (6) of the table are calculated from formula:

$$\Delta_{k,v} = \text{at } (|k - v(k,lb)| < z; 0); \text{ else } (\max(k, v(k,lb))). \quad (4)$$

By comparing the profiles, we obtain two indicators: ${}_h\Delta_I$ and ${}_h\Delta_{II}$ – generalized total ranks in zone I and II, respectively.

Within the framework of the method for determining the coherence of personal profiles of candidates, the described procedure is performed for all candidates to a project management team. In practice, during the implementation of international projects, the situation of choosing a project manager after the formation of a project team can occur. Then all candidates are considered as a potential manager one by one, and the similar procedure of comparison of candidates' profiles is performed.

4. 3. Method for the calculation of integrated indicator of results of pair-wise comparison of personal profiles of candidates

It is usually recommended to include from 2 to 10 people into a project management team [32]. It is therefore necessary to calculate the indicator reflecting the degree of coherence of all team members by their assessment of the importance of indicators of subjective well-being. We propose to use the mean value of the weighted average sum of overall total ranks of zones I and II, shown in Table 3, as the main component of the method for the calculation of such an indicator:

$${}_h\bar{\Delta}_{I,II} = \frac{0,8 \sum_{h=1}^H {}_h\Delta_I + 0,2 \sum_{h=1}^H {}_h\Delta_{II}}{H - 1}. \quad (5)$$

The numeric values of weighing the coefficients are determined based on the Pareto principle. During formation of a project management team, it makes it possible to take into consideration the proximity of coherence of the importance of the first five indicators of subjective well-being even to greater extent.

Given the number of indicators in zones I and II, the theoretically calculated value of the sum of generalized total rank ${}_h\bar{\Delta}$, can vary from minimum value of 0 to maximum value of 273. To find the maximum permissible value ${}_h\bar{\Delta}$, we will use the magnitude of the relative value of the threshold total rank in the method-analogue for assessment of the initial orientation of a candidate in the field of project management, which is 23.2 % of the maximum possible. By analogy, for our case, maximum admissible value ${}_h\bar{\Delta}$, must be equal to 64. More stringent conditions to the difference in the candidates' ranks in the proposed method make it possible to raise this value and accept it as equal to 70. This enables normalizing of ${}_h\bar{\Delta}$. Based on the normalized basic component, the heuristic formula of the coefficient of coherence of a project team by the criterion of subjective well-being was proposed:

$$\hat{K}_{swb} = 1 - \frac{0,8 \sum_{h=1}^H {}_h\Delta_I + 0,2 \sum_{h=1}^H {}_h\Delta_{II}}{70(H-1)} \quad (6)$$

In the situation of the best degree of coherence among team members by the importance of indicators of subjective well-being in zones I and II, coherence coefficient has the value of 1, while in its complete absence – 0.

4. 4. Development of the evaluation scale and the method for assessment of coherence of personal profiles of candidates

To form evaluation judgments about the degree of coherence of candidates' preferences (potential team members) in terms of the indicators of subjective well-being, it is necessary to develop an evaluation scale. The degree of its usefulness and adequacy depends on how much the judgments that are generated, while using it, will correspond to actual feeling by team members of their subjective well-being in joint activities. That is why, to build such a scale, we will use the results of the pilot social experiment, within which the information in the form of results of ranking the system models, their elements and indicators of subjective well-being, were obtained. 32 respondents from 7 African countries took part in the experiment. The selection of representatives of these countries is related to the fact that when selecting the basic indicators for system models in [11], mental preferences of the residents of the African continent were taken into account.

Each participant of the experiment implemented all procedures implied by the sequence of identification of the candidate's preferences regarding the indicators of subjective well-being (Fig. 1).

32 profiles were constructed based on the collected data in the course of the experiment. Then the profile of each candidate was accepted as overall ratings, and overall total ratings for all the other candidates were calculated in the reference to it. The obtained information was used to form the teams by the criterion of minimizing ${}_h\bar{\Delta}$ mean weighted sum of overall total ranks of zones I and II. As a result, 288 theoretically possible teams, combined into nine

groups, were formed. The groups differed by the number of team members from 2 up to 10 people. For each group, the minimum and maximum values ${}_h\bar{\Delta}$ were determined. The upper and lower curves correspond to these values in Fig. 2. For the teams with a different number of members, the section between the minimum and maximum values of ${}_h\bar{\Delta}$ is divided into five equal areas. The boundaries of the areas of the teams with different numbers of members are connected with one another. As a result, we obtained four curves, which are located between the upper and the lower curves.

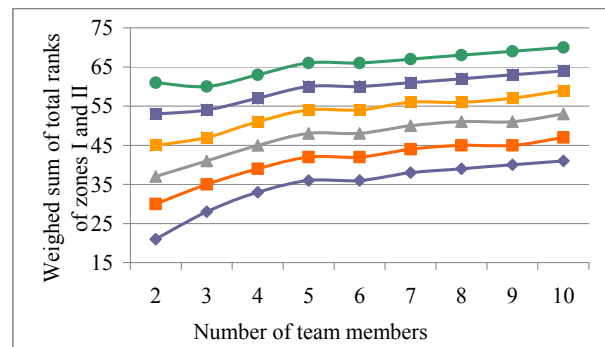


Fig. 2. Boundaries of intervals of the uniform distribution of the field of the experimentally determined values ${}_h\bar{\Delta}_{I,II}$ for the teams with a different number of members

An analysis of Fig. 2 shows that at an increase in the number of team members, there is a tendency of increasing the average weighted sum of overall total ranks. In this case, absolute variation between minimum and maximum values decreases. Maximum value ${}_h\bar{\Delta}$, reaches 70 for a team of 10 people. It does not exceed the previously calculated maximum value ${}_h\bar{\Delta}$.

Fig. 3 shows the curves of coefficient of coherence of project team \hat{K}_{swb} , plotted based on smoothed data of Fig. 2 with the use of the formula (6). Correlation factor between the data from Fig. 2 and the data obtained using Fig. 3, made up (-0.99). Each zone is represented by a linguistic variable, the name of which reflects the degree of coherence of the project team members based on the criterion of subjective well-being. The totality of zones is an estimation scale of the team coherence.

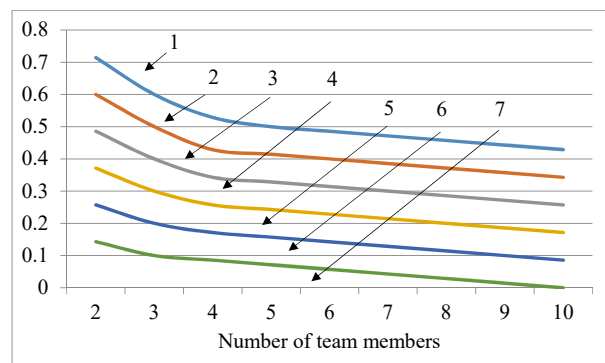


Fig. 3. Zones of coherence of project team members: 1 – ideal; 2 – high; 3 – rather high; 4 – admissible; 5 – undesirable; 6 – dangerous; 7 – non-admissible

Let us analyze the types of team distribution through applying the proposed zones (degrees) of coherence of a project team (Fig. 3). The information in Fig. 4 shows that the

modal values \hat{K}_{swb} in all groups except the first group are in the zone of a rather high coherence.

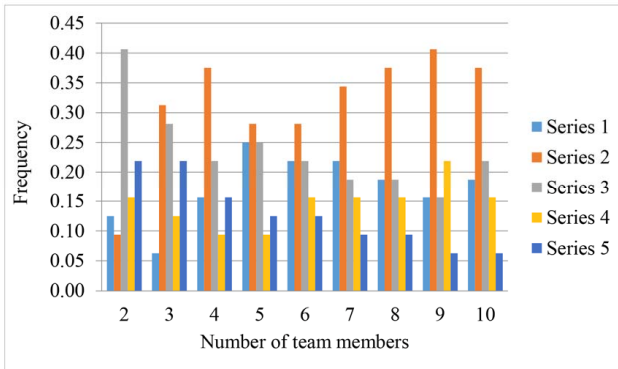


Fig. 4. Distribution of teams with different number of members by degree of coherence: Series 1 – high, Series 2 – rather high, Series 3 – admissible, Series 4 – undesirable, Series 5 – dangerous

The number of such teams depends on the number of their members and ranges from 28 % to 41 %. Uniting the data about the areas with high and rather high compatibility shows that the number of the teams of four members and above exceeds 50 (Fig. 5).

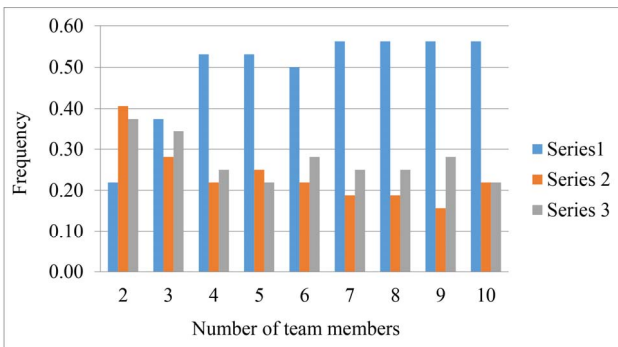


Fig. 5. Distribution of teams with different number of members by the groups of coherence degree: Series 1 – high and rather high, Series 2 – non-admissible, Series 3 – undesirable and dangerous

It should be noted that the number of teams consisting of 4–10 people located in the undesirable and dangerous zones is in the range of 22–28 %, and for small teams of 2–3 people – 34–38 %. This suggests that there is a high probability to form a team of 4–10 people with a high and rather high coherence degree from the same number of candidates by the criterion of subjective well-being. It is much more difficult to select a coherent team from 2–3 people.

4. 5. Experimental verification of the method for selection the candidates to a project team by the criterion of subjective well-being

At this stage of the study, it is necessary to answer the question of how adequate the information that is produced by the proposed method is. In other words, the extent to which the theoretically identified members of a theoretically coherent team are actually similar (close) according to the criterion of subjective well-being. It is possible to verify it in practice only sometime after the team formation, relying on expert evaluation of team members themselves regarding their subjective

well-being in a project in general and the similarity with other team members. In this respect, the method requires long-term full-scale testing in projects of varying scale, complexity level, risk, innovation, in different subject areas, implemented in different environments, especially given the international context. Within the study, we conducted pilot testing for initial evaluation of the adequacy of the results of the method.

To do this, the students of a higher educational establishment were involved. By virtue of specific organization and the activity environment, students jointly implement a variety of educational projects, constantly interact to perform various project tasks, as well as other activity beyond their frames. This is what gives grounds to consider them as experts in relation to each other in matters of evaluation of similarity relative to the indicators of subjective well-being.

All the tested who were the representatives of African countries, were grouped according to the criterion of duration of joint activities in educational projects before the pilot testing began. Thus, team 1 consisted of five people with the experience of two-month joint activities, and team 2 consisted of seven people who had the experience of a year-long joint work.

At the first phase of the pilot testing, the preferences concerning the indicators of subjective well-being by the proposed method were gathered from every team member. Based on these data, their personal profiles were constructed and the following indicators were calculated: overall total rank for indicators of zone I (${}_h\Delta_I$) and II (${}_h\Delta_{II}$); their sum (${}_h\Delta_I + {}_h\Delta_{II}$), as well as the mean value of the weighted sum of the overall total ranks of the zones (${}_h\bar{\Delta}$, Tables 4, 5).

Table 4

Indicators of individual profile of team members 1

Project manager	Indicators	Team members				
		1.1	1.2	1.3	1.4	1.5
1.1	${}_h\Delta_I$	0	67	49	89	64
	${}_h\Delta_{II}$	0	90	87	103	115
	${}_h\Delta_I + {}_h\Delta_{II}$	0	157	136	192	179
	${}_h\bar{\Delta}$	0	71.6	56.6	91.8	74.2
1.2	${}_h\Delta_I$	81	0	64	70	62
	${}_h\Delta_{II}$	99	0	145	127	91
	${}_h\Delta_I + {}_h\Delta_{II}$	180	0	209	197	153
	${}_h\bar{\Delta}$	84.6	0	80.2	81.4	67.8
1.3	${}_h\Delta_I$	45	61	0	101	70
	${}_h\Delta_{II}$	96	141	0	112	110
	${}_h\Delta_I + {}_h\Delta_{II}$	141	202	0	213	180
	${}_h\bar{\Delta}$	55.2	77	0	103.2	78
1.4	${}_h\Delta_I$	94	77	76	0	88
	${}_h\Delta_{II}$	125	122	120	0	126
	${}_h\Delta_I + {}_h\Delta_{II}$	219	199	196	0	214
	${}_h\bar{\Delta}$	100.2	86	84.8	0	95.6
1.5	${}_h\Delta_I$	67	54	89	77	0
	${}_h\Delta_{II}$	98	97	104	147	0
	${}_h\Delta_I + {}_h\Delta_{II}$	165	151	193	224	0
	${}_h\bar{\Delta}$	73.2	62.6	92	91	0

Table 5
Indicators for individual profile of team members 2

Project manager	Indicators	Team members						
		2.1	2.2	2.3	2.4	2.5	2.6	2.7
2.1	${}_h\Delta_I$	0.0	72.0	90.0	64.0	50.0	42.0	14.0
	${}_h\Delta_{II}$	0.0	83.0	96.0	37.0	128.0	96.0	118.0
	${}_h\Delta_I + {}_h\Delta_{II}$	0.0	155.0	186.0	101.0	178.0	138.0	132.0
	${}_h\bar{\Delta}$	0.0	74.2	91.2	58.6	65.6	52.8	34.8
2.2	${}_h\Delta_I$	61.0	0.0	84.0	56.0	82.0	52.0	53.0
	${}_h\Delta_{II}$	109.0	0.0	97.0	93.0	112.0	118.0	97.0
	${}_h\Delta_I + {}_h\Delta_{II}$	170.0	0.0	181.0	149.0	194.0	170.0	150.0
	${}_h\bar{\Delta}$	70.6	0.0	86.6	63.4	88.0	65.2	61.8
2.3	${}_h\Delta_I$	78.0	49.0	0.0	71.0	33.0	41.0	65.0
	${}_h\Delta_{II}$	125.0	128.0	0.0	150.0	89.0	98.0	104.0
	${}_h\Delta_I + {}_h\Delta_{II}$	203.0	177.0	0.0	221.0	122.0	139.0	169.0
	${}_h\bar{\Delta}$	87.4	64.8	0.0	86.8	44.0	52.4	72.8
2.4	${}_h\Delta_I$	57.0	44.0	89.0	0.0	85.0	60.0	68.0
	${}_h\Delta_{II}$	59.0	118.0	141.0	0.0	143.0	112.0	98.0
	${}_h\Delta_I + {}_h\Delta_{II}$	116.0	162.0	230.0	0.0	228.0	172.0	166.0
	${}_h\bar{\Delta}$	57.4	58.8	99.4	0.0	96.6	70.4	74.0
2.5	${}_h\Delta_I$	74.0	63.0	43.0	82.0	0.0	58.0	57.0
	${}_h\Delta_{II}$	105.0	126.0	111.0	129.0	0.0	72.0	83.0
	${}_h\Delta_I + {}_h\Delta_{II}$	179.0	189.0	154.0	211.0	0.0	130.0	140.0
	${}_h\bar{\Delta}$	80.2	75.6	56.6	91.4	0.0	60.8	62.2
2.6	${}_h\Delta_I$	38.0	65.0	67.0	55.0	37.0	0.0	42.0
	${}_h\Delta_{II}$	106.0	99.0	70.0	120.0	62.0	0.0	61.0
	${}_h\Delta_I + {}_h\Delta_{II}$	144.0	164.0	137.0	175.0	99.0	0.0	103.0
	${}_h\bar{\Delta}$	51.6	71.8	67.6	68.0	42.0	0.0	45.8
2.7	${}_h\Delta_I$	20.0	60.0	75.0	73.0	36.0	36.0	0.0
	${}_h\Delta_{II}$	118.0	87.0	116.0	103.0	121.0	73.0	0.0
	${}_h\Delta_I + {}_h\Delta_{II}$	138.0	147.0	191.0	176.0	157.0	109.0	0.0
	${}_h\bar{\Delta}$	39.6	65.4	83.2	79.0	53.0	43.4	0.0

Then a list of short-term educational projects was determined for each team separately. The projects were implemented within three months. After this each team member evaluated all the other members of their team, with who they

interacted during the project. The essence of the evaluation was to establish the scores for all 27 basic indicators of subjective well-being by a five-point scale. The score reflected their expert opinion on the importance of a certain basic indicator (5 – very important, 1 – absolutely unimportant) for a team member. In team 1, each team member gave 135 scores immediately after the completion of the projects, and in team 2 – 189 scores three months after completion of the projects. Based on the obtained scores and the ranking priorities of the importance of basic indicators of subjective well-being of a team member, who was conventionally (alternately) accepted as a project leader, the following indicators were calculated: overall total basic indicators for zones I (${}_h^p\Delta_I$) and II (${}_h^p\Delta_{II}$); the sum of the zone total scores (${}_h^p\Delta_I + {}_h^p\Delta_{II}$), as well as the mean value of the weighted sum of the overall total scores (${}_h^p\bar{\Delta}$, Tables 6, 7)

Table 6

Indicators of assessing the importance of basic indicators of subjective well-being for team members 1

Project manager	Indicators	Team members					$r_{{}_h^p\Delta}$
		1.1	1.2	1.3	1.4	1.5	
1.1	${}_h^p\Delta_I$	0	20	20	18	17	0.863
	${}_h^p\Delta_{II}$	0	33	34	28	29	-0.862
	${}_h^p\Delta_I + {}_h^p\Delta_{II}$	0	53	54	46	46	-0.941
	${}_h^p\bar{\Delta}$	0	22.6	22.8	20	19.4	0.884
1.2	${}_h^p\Delta_I$	18	0	21	16	14	0.934
	${}_h^p\Delta_{II}$	24	0	35	31	21	0.997
	${}_h^p\Delta_I + {}_h^p\Delta_{II}$	42	0	56	47	35	0.968
	${}_h^p\bar{\Delta}$	19.2	0	23.8	19	15.4	0.967
1.3	${}_h^p\Delta_I$	21	21	0	19	2	0.503
	${}_h^p\Delta_{II}$	29	34	0	26	7	0.365
	${}_h^p\Delta_I + {}_h^p\Delta_{II}$	50	55	0	45	9	0.055
	${}_h^p\bar{\Delta}$	22.6	23.6	0	20.4	3	0.584
1.4	${}_h^p\Delta_I$	18	23	23	0	20	0.913
	${}_h^p\Delta_{II}$	17	17	17	0	15	-0.666
	${}_h^p\Delta_I + {}_h^p\Delta_{II}$	35	40	40	0	35	-0.977
	${}_h^p\bar{\Delta}$	17.8	21.8	21.8	0	19	0.940
1.5	${}_h^p\Delta_I$	23	16	24	22	0	0.981
	${}_h^p\Delta_{II}$	32	25	32	31	0	0.274
	${}_h^p\Delta_I + {}_h^p\Delta_{II}$	55	41	56	53	0	0.564
	${}_h^p\bar{\Delta}$	24.8	17.8	25.6	23.8	0	0.978

As one can see, for the prevailing majority of the team members, the values of the overall total rank of zone I is

smaller than those of zone II. The teams, where project managers are team members 1.4, 2.2 and 2.3 are the exception.

Table 7

Indicators for assessing the importance of basic indicators of subjective well-being for team members 2

Project manager	Indicators	Team members							$r_{h\Delta, h\bar{\Delta}}$
		2.1	2.2	2.3	2.4	2.5	2.6	2.7	
2.1	${}^p_h\Delta_I$	0.0	19.0	12.0	16.0	19.0	18.0	16.0	0.511
	${}^p_h\Delta_{II}$	0.0	29.0	24.0	21.0	32.0	23.0	24.0	0.856
	${}^p_h\Delta_I + {}^p_h\Delta_{II}$	0.0	48.0	36.0	37.0	51.0	41.0	40.0	0.897
	${}^p_h\bar{\Delta}$	0.0	21.0	14.4	17.0	21.6	19.0	17.6	0.719
2.2	${}^p_h\Delta_I$	15.0	0.0	15.0	9.0	18.0	16.0	11.0	0.567
	${}^p_h\Delta_{II}$	13.0	0.0	23.0	22.0	26.0	26.0	10.0	0.803
	${}^p_h\Delta_I + {}^p_h\Delta_{II}$	28.0	0.0	38.0	31.0	44.0	42.0	21.0	0.922
	${}^p_h\bar{\Delta}$	14.6	0.0	16.6	11.6	19.6	18.0	10.8	0.940
2.3	${}^p_h\Delta_I$	12.0	3.0	0.0	20.0	8.0	9.0	12.0	0.795
	${}^p_h\Delta_{II}$	13.0	8.0	0.0	24.0	22.0	18.0	11.0	0.657
	${}^p_h\Delta_I + {}^p_h\Delta_{II}$	25.0	11.0	0.0	44.0	30.0	27.0	23.0	0.725
	${}^p_h\bar{\Delta}$	12.2	4.0	0.0	20.8	10.8	10.8	11.8	0.768
2.4	${}^p_h\Delta_I$	8.0	5.0	10.0	0.0	14.0	7.0	1.0	0.740
	${}^p_h\Delta_{II}$	13.0	10.0	16.0	0.0	21.0	14.0	14.0	0.864
	${}^p_h\Delta_I + {}^p_h\Delta_{II}$	21.0	15.0	26.0	0.0	35.0	21.0	15.0	0.885
	${}^p_h\bar{\Delta}$	9.0	6.0	11.2	0.0	15.4	8.4	3.6	0.828
2.5	${}^p_h\Delta_I$	19.0	22.0	18.0	18.0	0.0	13.0	21.0	0.833
	${}^p_h\Delta_{II}$	30.0	31.0	31.0	28.0	0.0	21.0	34.0	0.888
	${}^p_h\Delta_I + {}^p_h\Delta_{II}$	49.0	53.0	49.0	46.0	0.0	34.0	55.0	0.898
	${}^p_h\bar{\Delta}$	21.2	23.8	20.6	20.0	0.0	14.6	23.6	0.875
2.6	${}^p_h\Delta_I$	7.0	9.0	8.0	8.0	7.0	0.0	15.0	0.619
	${}^p_h\Delta_{II}$	18.0	28.0	12.0	17.0	23.0	0.0	22.0	0.664
	${}^p_h\Delta_I + {}^p_h\Delta_{II}$	25.0	37.0	20.0	25.0	30.0	0.0	34.0	0.733
	${}^p_h\bar{\Delta}$	9.2	12.8	8.8	9.8	10.2	0.0	16.4	0.679
2.7	${}^p_h\Delta_I$	20.0	20.0	18.0	17.0	19.0	19.0	0.0	0.593
	${}^p_h\Delta_{II}$	29.0	34.0	28.0	24.0	31.0	32.0	0.0	0.827
	${}^p_h\Delta_I + {}^p_h\Delta_{II}$	49.0	54.0	46.0	41.0	50.0	51.0	0.0	0.830
	${}^p_h\bar{\Delta}$	21.8	22.8	20.0	18.4	21.4	21.6	0.0	0.729

5. Discussion of results of the development and experimental application of the method for a project team configuration

The scores (${}^p_h\Delta$, ${}^p_h\Delta$, (${}^p_h\Delta_I + {}^p_h\Delta_{II}$) and ${}^p_h\bar{\Delta}$), calculated based on the empirical data, by their nature completely correspond to similar indicators, calculated within the proposed method (${}_h\Delta$, ${}_h\Delta$, (${}_h\Delta_I + {}_h\Delta_{II}$) and ${}_h\bar{\Delta}$). This makes it possible to calculate correlation factors $r_{h\Delta, h\bar{\Delta}}$ between the similar indicators of Tables 4–7 to prove the existence or the absence of the relation between them. Calculation results are shown in Table 8, the analysis of which makes it possible to

draw the following conclusions. Out of the four indicators that were explored for verification of matching of the results obtained based on the developed method, and the estimates of importance of the basic indicators, the indicator of the mean value of weighed sum of the overall total ranks of zone I and II ${}_h\bar{\Delta}$ has its highest value at the least variation. This proves the correctness of its selection as the main component of the heuristic formula of calculation of the coefficient of compatibility of a project team according to the criterion of subjective well-being.

Table 8

Statistical characteristics for coefficients of correlation between the indicators of estimates of importance, obtained using the developed method and based on judgments of team members as experts

Statistical characteristics	Indicators for evaluation of the importance of basic indicators of subjective well-being			
	${}_h\Delta_I$	${}_h\Delta_{II}$	${}_h\Delta_I + {}_h\Delta_{II}$	${}_h\bar{\Delta}$
Minimum value	0.503	-0.862	-0.977	0.584
Maximum value	0.981	0.997	0.968	0.978
Mean value	0.737	0.472	0.463	0.824
Standard deviation	0.172	0.617	0.708	0.128
Median	0.767	0.734	0.781	0.852
Power of relation for mean value by Chaddock scale	High, closer to mean	Mean	Mean	High, closer to very high

Insignificant deviations from of medians from mean values is observed for the generalized total rank zone I ${}_h\Delta$ and the weighted sum of the overall total ranks ${}_h\bar{\Delta}$. This indicates that five most important indicators of a candidate are determining for the coefficient of compatibility of a project team.

The higher and more stable values of statistical characteristics for ${}_h\bar{\Delta}$ in comparison with ${}_h\Delta$ prove the necessity of taking into consideration indicators of zone II when determining \bar{K}_{sub} .

It should be noted that the time lag in assessing the importance of indicators of subjective well-being decreases the magnitude of correlation factors. This is due to the natural process of forgetting details that are fresh in memory immediately after the completion of projects. However, at the same time, the validity of residual information is retained. The external observation of the work of project teams showed high coherence of team 2. They have obtained better results within the shorter period of time. The team was more productive. Objectively, this fact reflects the number of theoretically possible combinations of teams consisting of two people, which can be formed based on team 2 and which will get to the zone of a rather high compatibility (team 2.1–2.7) and of admissible compatibility (teams 2.3–2.5, 2.6–2.5). For these zones, value ${}_h\bar{\Delta}$ lies within the range of 28–36 and 36–44, respectively. In addition, for this team, it is also possible to form three teams that fall into the undesirable zone (${}_h\bar{\Delta} = 44–52$), but still not to the dangerous zone. For team 1, such combinations are not available. The best theoretically possible team 1.1–1.3 gets to the dangerous zone.

Comparison of the values ${}_h\bar{\Delta}$ for team 1.1–1.3 and 1.3–1.1 shows that its value depends of the selection of the

base of comparison (selection of a project manager). Thus, for team 1.1–1.3 ${}_h\bar{\Delta} = 56,6$, and for 1.3–1.1 ${}_h\bar{\Delta} = 55,2$. There are such examples also in team 2. For the theoretically possible team 2.6–2.7 ${}_h\bar{\Delta} = 45,8$, and for 2.7–2.1 ${}_h\bar{\Delta} = 43,4$. In this case, the team changed the zone of coherence – it transferred from the undesirable zone to the admissible zone. For given examples, the difference in indicators ${}_h\bar{\Delta}$ is not very big. However, for the team of members 2.6 and 2.5, a change in the project manager is very significant (for team 2.6–2.5 ${}_h\bar{\Delta} = 42$, and for 2.5–2.6 ${}_h\bar{\Delta} = 60,8$). This fact must be taken into consideration when a project manager is appointed.

An analysis of the research results allows us to state that the main advantage of the developed method of the team configuration by the criterion of subjective well-being is its invariance with respect to the activity areas of project teams, their gender, national and other features. The undoubted advantage of this method is the possibility to select a project team from a limited number of applicants with the maximum possible degree of compatibility. In this case, due to this determining compatibility prior to the beginning of the team work, it is possible to identify its strengths and weaknesses by the criterion of subjective well-being.

As a disadvantage, we should note that the method does not take into account a possible change in the priority of the importance of indicators of social well-being in team members in the process of the project implementation.

The invariance of the developed method makes it possible to recommend it for the use in the formation of project teams of any classes, types, kinds, and other contextual features.

The proposed method was a logical addition to the methods of project teams formation [21, 22, 25].

Further improvement of the method and its development is seen in the creation of the computer toolset of its support. It is planned to apply the mathematical apparatus for determining the degree of harmony of the state of socio-economic systems (analogue of the entropy method), developed by the authors for the problems of description of management of innovative development of project-oriented enterprises. In addition, it is necessary to explore further the problems of application of the method with more team members and with higher cultural (mental) and other heterogeneity, in projects of different subject area, different levels of complexity, scale, and risk.

6. Conclusions

1. At the stage of formation of personal profiles of candidates to the project management team, a distinctive conceptual feature of the proposed method is the application of the method of candidates' self-analysis by ranking the same set of 27 indicators of subjective well-being. This makes it possible to avoid the need to formalize and agree

(average) unique rating scales of candidates or to develop the universal knowingly inaccurate scale. The application of this approach provides the necessary accuracy and increases reliability of the obtained information. The representation of the indicators using three systematic quartile models was substantiated. The proposed procedure for formalization of personal profiles of candidates allows making their pair-wise comparison.

2. Pair-wise comparison of candidates' profiles implies the calculation of mean value of the weighted sum of overall total ranks of the indicators of two zones. The first zone contains five most important indicators of subjective well-being, and the second zone – following by importance seven indicators. One of the compared profiles is selected as the reference profile and sets the priority of the indicators of subjective well-being. The result of comparison of the profiles is the parameter that takes the value of zero at the difference between ranks of less than the assigned magnitude (2 for the first zone, 3 for the second zone). If the difference of ranks exceeds 2 and 3 respectively, the parameter takes the value of the highest rank of the indicators of subjective well-being. Calculated parameters are added together for each zone separately. After this, the mean value of the weighted sum of the overall total ranks of the zones is determined.

3. The results of the pair-wise comparison of personal profiles of candidates are used to calculate the integral indicator – coefficient of coherence of a project team by the criterion of subjective well-being. The heuristic formula was proposed to calculate it. Its main component is the mean value of the weighted sum of overall total ranks of the first and second zones of indicators of subjective well-being.

4. The most important element of the method for the configuration of a project team is the developed estimation scale of coefficient of coherence of team members in the form of seven interval zones. The scale is constructed based on the generalized empirical results of the pilot social experiment. The coefficient of correlation between the boundaries of the interval zones and experimental data is (–0.99). Each zone corresponds to a different degree of coherence: ideal, high, rather high, admissible, undesirable, dangerous, and unacceptable. At the increase in the number of team members from two to ten, the boundary values of the zones of coherence coefficient decrease by 35–40 %.

5. The experimental validation of the method was carried out during formation of international teams of educational projects. The representatives of seven countries of the African continent participated of the teams consisting of 5 and 7 members. The workability of the method was proved by the high value of correlation between the theoretically calculated values of the coefficient of coherence of the teams and the experimentally derived estimates of coherence of the team participants. At the mean value of correlation factor of 0.824, its standard deviation for 13 teams was 0.128.

References

1. Wysocki R. K. Building Effective Project Teams. John Wiley & Sons, 2001. 384 p.
2. Banister-Hazama D., Moreci J., England K. Increase project team effectiveness: step-by-step // PMI Global Congress Proceedings. 2012.
3. Individual competence baseline for project, programme and portfolio management // International Project Management Association (IPMA). 2015. 431 p. URL: <http://products.ipma.world/ipma-product/icb/read-icb/>
4. World Happiness Report. 2017. URL: <http://worldhappiness.report/ed/2017/>

5. Cheung C., Davis J., Cui Q. Happiness for project managers: framework and empirical analysis // 33rd Annual Association of Researchers in Construction Management (ARCOM) Conference Proceedings. 2017. URL: <http://pm.umd.edu/wp-content/uploads/2017/09/Happiness-for-project-managers-Framework-and-empirical-analysis-2017-ARCOM-vf-2-FINAL.pdf>
6. Schwartz S. H., Sortheix F. M. Values and subjective well-being // Handbook of well-being. Salt Lake City, UT: DEF Publishers, 2018. URL: <https://www.nobascholar.com/chapters/51/download.pdf>
7. Dzhidar'yan I. Psihologiya schast'ya i optimizma. Moscow: Institut psihologii RAN, 2013. 268 p.
8. Cooke H. S. Project management and team happiness. 2018. URL: <https://infoworks.com/project-management-and-team-happiness/>
9. Emil Berg M., Terje Karlsen J. How project managers can encourage and develop positive emotions in project teams // International Journal of Managing Projects in Business. 2014. Vol. 7, Issue 3. P. 449–472. doi: <https://doi.org/10.1108/ijmpb-01-2013-0003>
10. Osakwe I. Project team building by the criterion of fulfillment (happiness): main problems and conceptual baselines // Upravlinnia proektamy ta rozvytok vyrobnytstva. 2016. Issue 2. P. 110–124.
11. Rach V., Osakwe I. Method to Create Personal Profile of the Project Team Candidate by the Criteria of Well-being Based on Ranking Procedures // International Journal of Innovative Research and Development. 2017. Vol. 6, Issue 12. P. 219–232. doi: <https://doi.org/10.24940/ijird/2017/v6/i12/120374-284704>
12. Landon L. B., Slack K. J., Barrett J. D. Teamwork and collaboration in long-duration space missions: Going to extremes // American Psychologist. 2018. Vol. 73, Issue 4. P. 563–575. doi: <https://doi.org/10.1037/amp0000260>
13. Aretoulis G. Gender Based Perception of Successful Construction of Project Managers' Attributes // Social Sciences. 2018. Vol. 7, Issue 7. P. 112. doi: <https://doi.org/10.3390/socsci7070112>
14. The Effect of Teambuilding on Team Development: A Quasi-Experiment within a Swedish State Authority / Jacobsson C., Nissling L., Skar L., Archer T. // Clinical and Experimental Psychology. 2017. Vol. 03, Issue 03. doi: <https://doi.org/10.4172/2471-2701.1000164>
15. Udo N., Koppensteiner S. What are the core competencies of a successful project manager? // Project Management Institute, PMI® Global Congress. Prague, 2004. URL: <https://www.pmi.org/learning/library/ore-competencies-successful-skill-manager-8426>
16. Hassan M. K., Ilyas M. A. B. Change agility across different cultures // Project Management Institute, PMI® Global Congress. Barcelona, 2016. URL: <https://www.pmi.org/learning/library/change-agility-different-cultures-10188>
17. Personality, resilience, self-regulation and cognitive ability relevant to teacher selection / Sautelle E., Bowles T., Hattie J., Arifin D. N. // Australian Journal of Teacher Education. 2015. Vol. 40, Issue 4. URL: <https://ro.ecu.edu.au/cgi/viewcontent.cgi?article=2575&context=ajte>
18. Effects of Team Personality Composition on Member Performance: A Multilevel Perspective / Prewett M. S., Brown M. I., Goswami A., Christiansen N. D. // Group & Organization Management. 2018. Vol. 43, Issue 2. P. 316–348. doi: <https://doi.org/10.1177/1059601116668633>
19. Wu M., Chen Y.-H. A factor Analysis on Teamwork Performance -an Empirical Study of Inter-instituted Collaboration // Eurasian Journal of Educational Research. 2014. Issue 55. P. 37–54. doi: <https://doi.org/10.14689/ejer.2014.55.3>
20. A Review and Integration of Team Composition Models / Mathieu J. E., Tannenbaum S. I., Donsbach J. S., Alliger G. M. // Journal of Management. 2014. Vol. 40, Issue 1. P. 130–160. doi: <https://doi.org/10.1177/0149206313503014>
21. Rossoshanskaya O. V., Biryukov O. V. Forming management team for the project realization per competence approach // Upravlinnia proektamy ta rozvytok vyrobnytstva. 2010. Issue 1 (33). P. 127–146.
22. Cherepaha G. S. Product-environmental approach to forming the project team within discipline “dynamic leadership in project management” // Upravlinnia proektamy ta rozvytok vyrobnytstva. 2010. Issue 2 (34). P. 59–73.
23. Pantileev S. R. Samootnoshenie kak emocional'no-ocenochnaya sistema. Moscow: Izd-vo MGU, 1991. 100 p.
24. Lysenko D. E. Adaptaciya metoda precedentov dlya podderzhki processa otbora i rasstanovki personala proekta // Systemy obrobky informatsiyi. 2008. Issue 1 (68). P. 20–23.
25. Alatoom M. Metod planirovaniya sodержaniya myagkih proektov po kriteriyu vazhnosti formiruemyh kompetentnostey // Upravlinnia proektamy ta rozvytok vyrobnytstva. 2014. Issue 3 (51). P. 116–129.
26. Rach V. A. Metodologicheskie metriki nauki upravleniya proektami // Upravlinnia proektamy ta rozvytok vyrobnytstva. 2014. Issue 3 (51). P. 18–26.
27. Larichev O. I. Verbal'nyy analiz resheniy. Moscow: Nauka, 2006. 181 p.
28. Rossoshanskaya O. V. Model' upravleniya vysshim uchebnym zavedeniem v sovremennyh usloviyah // Upravlinnia proektamy ta rozvytok vyrobnytstva. 2000. Issue 2 (2). P. 123–127.
29. Panina N. V. Tekhnolohiya sotsialnoho doslidzhennia. Kyiv: Naukova dumka, 1996. 233 p.
30. Hili Dzh. Statistika: sociologicheskie i marketingovyie issledovaniya. Kyiv: DiaSoft YUP; Sankt-Peterburg: Piter, 2005. 638 p.
31. Bushuev S. D., Morozov V. V. Dinamicheskoe liderstvo v upravlenii proektami: monografiya. 2-e izd. Kyiv: Ukrainskaya asociaciya upravleniya proektami, 2000. 312 p.
32. Burgan S. C., Burgan D. S. One size does not fit all: Choosing the right project approach // PMI Global Congress Proceedings, Project Management Institute. Phoenix, 2014.