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Method to Create Personal Profile of the Project Team Candidate by the Criteria of Well-being Based on Ranking Procedures

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Abstract:
A method of creating a candidate's personal profile using subjective well-being as a base for its creation by ranking indicators was made. The method is based on proposed system of subjective well-being indicators, where each indicator reflects three contexts (psychological, sociological, working place), and each context is presented by means of appropriate system model with four elements. As far as each candidate has his/her own understanding of those indicators as well as feeling of their value and measuring scale, the method uses ranking procedures to process verbal judgments, reflecting natural multi-dimensionality of the interpretations of any subjective well-being indicator. Thus, the method implements five steps based on created mathematical model.

***Keywords**: project team, candidate, methodologies, subjective well-being, happiness, fulfillment, categorization, ranking, system model*

1. Approach Background

In this new age of technological developments and evolution trends in management in which change has remained the number one constant, it is vital that we take note of the key trends that change the environment in modern projects.

To look at the modern trends of project management and how it has been in recent times and age, we will have to look a little more into environment factors, the external influences that shape up and affect project management in different ways. Some of these would-be economies, uncertainties, changes, instability, complexities, and weather. Indeed, they are way too many to mention, but we have to start somewhere and limit it for the sake of focus on this research. Looking at them with some more level of details, we will now examine how a few of them can affect projects and their management [Joe Taylor 2008; Timothy Vizard et al (2014); Matthew Nickasch et al (2008);Matthew Nickasch et al 2015]. Based on this, it's possible to say that the main tendency of modern projects environment is that it became more complex and changeable, less predictable and controlled.

This might influence the general tendency of the projects success and failure for recent decades. Many authors have written about reasons for failure few of which are stated above [PURNA CHANDRA DEY 2015, Project Journal September 2015; Ósk Sigurðardóttir:2013; Xiaofeng Song1 et al 2013]. Besides, the CHAOS reports by Standish Group of software projects for many years already show that projects success and failure rates are practically stable and still within the same range. This would mean that there hasn't been anything new that caused a drastic change in the level of success, failures and challenged projects. But there haven't been significant changes in practical application in projects.

Haven looked at the accumulated list of reasons for failures, we realized that we can group them to highlight main tendencies. The results of such grouping are shown below. We can detect five essential groups of reasons:

1) leadership chain relationship problems;
2) Project approach and methodology management problems;
3) Project team relationship management;
4) Erroneous costs/financial implications;
5) Cultural and ethical misalignment.

In making these grouping, it becomes easier to understand the reasons for failure and the most frequent is the weak-point which in this case is leadership chain relationship problems followed closely by Project team relationship management and Cultural and ethical misalignment. From the description of classifications, we infer that the greatest reason for project failure is human resource management.

As a result; different approaches will expectedly give birth to different PT management development and evolutions and relationships with respect to methodologies. To manage projects more effectively this has had to be done. It's not exactly a new approach as of today. Using NCB, Behavioral competences for project team. ICB has its own slightly different approach to projects management. They view it in terms of behavioral competencies. So also, is their views to reasons for project failures and personality issues. Based on ICB approach failures are often related to ineffective team working sometimes caused by aggressive project environment because of fast changes and turbulence. To be effective in such environment, project team members should have specific competences (NCB, Behavioral competences) although these competencies have not exactly been the same over the years as they have changed with editions, therefore some things were added and some others removed. Looking at ICB 2.0. 3.0 and 4.0. The similarities are there as well as deductions as shown below according to Ósk Sigurðardóttir (May 2013) [Ósk Sigurðardóttir:2013].

Considering P2M, it offers the following characteristics:

1) applicability deduced from practical experience;
2) reflection of Japanese cultural, structural and industrial strength;
3) avoidance of too meticulous Definitions and practices, thus providing leeway for case-to-case applications;
4) setting of rules to utilize human intelligence and IT potentials;
5) emphasis of total thinking rather than segmentation and precise combination of management elements" (Guidebook of Project & Program Management for Enterprise Innovation 2001).

It has always had a special approach project management. It is most of all about human resource in project team.

But beside traditional, new project management methodologies appeared, reflecting new flexible tendencies - Agile and SCRUM. According to Agilemethodology.org Agile is "not a methodology! The Agile movement seeks alternatives to traditional project management. Agile approaches help teams respond to unpredictability through incremental, iterative work cadences and empirical feedback" (Understanding the Agile Methodology January 2017). This means that it is not a methodology, it's more of an approach, a movement, a new perception that deals more with the people. "Agile project management focuses on continuous improvement, scope flexibility, team input, and delivering essential quality products. Agile project management methodologies include scrum, extreme programming (XP), and lean, among others. These methodologies all adhere to the Agile Manifesto and the 12 Agile Principles, which focus on people, communications, the product, and flexibility" (Mark C. Layton). This is a straight way to show that it is based on people and their interactions, all its focus is basically about the people.

So, we can conclude about the main tendency of modern projects environment is changing the role of personality as HR of companies and their projects. They are expected to dispose competence, not just qualification, to still be effective in such complex environment. PM methodologies became more human and competence oriented. This led to the introduction of new managerial parameters focused on personalities' state as a reason and factor of effective working – Fulfillment, Happiness, well-being. 'Subjective well-being is the scientific term for happiness and life satisfaction-thinking and feeling that your life is going well, not badly' [Edward Diener]. It is an individual's experience of affective reactions and cognitive judgments (Teresa Del Pilar Rojas 2016). This could also be viewed as how people experience their individual lives with respect to emotional, logical as well as cognitive judgments. It therefore encompasses moods and emotions as well as evaluations of one's satisfaction with general and specific areas of one's life (Rituparna Prasoon and K R Chaturvedi). Although it is very person for there to be the existence of similarities. Subjective Well-Being according: The Science of Happiness and Life Satisfaction *(Subjective well-being) is defined as 'a person's cognitive and affective evaluations of his or her life' (Diener, Lucas, & Oishi, 2002, p. 63)*.

We can conclude that this basically is the study of what makes up the life of a person from their perspectives, their approaches, and these determine their reactions to events that take place in their lives. It varies from person to person as it is deeply individualistic.

Based on this, for the most part of human resource management, subjective well-being (herein and after, SWB) is an undeniable part which determines the life and fulfillment of a team or practitioners. With respect to human resource management Mihaela Man wrote "Subjective well-being has a stable temporal component that can generate interest of practitioners in the field of human resources management to incorporate this variable into predictive models of professional performance, models which will become employable in the processes of HRM. At the same time, since this component also has part which may be modeled after the persons have been employ edit may increase the prospective of future effects of SWB on other variables such as: job satisfaction, task performance, organizational citizenship behavior, etc." [Mihaela MAN, 2015]. As a category of HRM, it is such a vital part because it summarizes the unspoken real needs of members of a project team, staff members and the general stakeholders. But then for the most of HRM, it's never really detailed enough. What is the main idea: This is the aspect of management of human resource that affects the level of comfort and ease with which team members work within the organization. This could be in policies, relationships and many more. Based on these then the SWB of an employee is a major key player in the effectiveness and results of their performance. As a result; it is very important that SWB is taken seriously with respect to its relational effect on the modern economy concept of the 21st century.

We can conclusively say boldly that it is therefore very vital that SWB is considered a vital part of any economy that seeks modernization and development. This could be the reason SWB and happiness now is the mainstream in general management, and many organizations have special departments or this special function within HR department but hardly really on the SWB of the potential project team especially touching on the criteria of what they consider very vital.

Like earlier shown in this research it is easy to notice that a lot has been done in the project team selection project management field. It is so easy to get a team to work. Ranging from the works by PMBOK to individual, ICB and many others. In all of these SWB has been mentioned indirectly in all as a factor in managing projects, yet none has been able to make it a factor in selection or creation of project team. This may largely be accrued to the fact that it is an immeasurable concept that exists in the minds of many but without a method or unit of measurement may be almost impossible to put to work for most organization.

The major issue with project team selection with organizations and researchers is that they recognize the importance of SWB but are unable to find its units or standards or even anything related directly to the measurement or determination of SWB of a prospective project team. However, SWB is so important in the formation of a project team because it helps the project manager and the stake holders to fully understand what it takes to get the very best out the project team and get the desired maximum result.

2. Initial Baselines and Assumptions

In our previous studies [Osakwe Ikenna et al. 2016] we have shown that to describe the applicant's submission to the project team about SWB it is enough to use 27 basic indicators (table 1). The essential peculiarity of the approach is that each indicator we consider as one that reflects three contexts: A - psychological (Social status; recognition; psychology, safety and others; self-realization), sociological (in family; in team; in activity; health), Job (involving; empowerment; workplace environment; recognition).

N	Indicators	Maslow Pyramid based system of Indicators A	Sociologically based system of Indicators B	Job based Systems of Indicators C
1	Participation in Decision making	Recognized as a vital part of decisions	Consulted before decisions on activities	Always involved in decisions about activities
2	Trust of organization	Noted for results	Believe in his decisions on what to be done and how	Opinion respected and considered worthy
3	Anticipated growth	Realizing personal dreams in the company	There are future expectations	Part of the goal and plan setters
4	Responsibilities	Allowed to discover their abilities	Well defined duties and boundaries	Empowered to carry out responsibilities
5	Recognition	Seen as efforts are put in	Efforts are appreciated	Rewarded with deserved honor
6	Addressing grievances/satisfied with work relationships with the people around me	Maintaining a good working atmosphere	Ensuring the tempo within the team is always warm	Ensuring an environment that is friendly
7	Initiation and leadership	Using of original thoughts to get results	Bringing in innovative activities	Being part of the leadership
8	satisfied with the given right to put forward my opinions	Full Freedom of expression	Existence of Collective team voicing	Their voices are listened to
9	satisfied with the leaders in my workplace as positive role models	Leadership being the first to act and go forward	Inspiring the team by your actions	Comfortable with the leadership team
10	Empowerment	Bringing the best out in them	The permission to do what needs to be done	Empowered to get things done
11	satisfaction & personal achievement	Fulfilling personal goals	Comfortable family goals thriving	Allowed to dream and achieve
12	satisfied employee assistance policy of the company	Working conditions should be made easier by leadership	Healthy working atmosphere	Comfortable atmosphere to ease the job
13	satisfied & able to maintain a healthy balance between work and family life	Enough time to have a life outside of work	Enough time for family	Rewards with breaks and time offs
14	Monetary benefits	Availability of Financial rewards	Availability of Financial incentives	Appreciated monetarily
15	Appreciation	Recognized as Important	Feel valued by the team	Desired and accepted

N	Indicators	Maslow Pyramid based system of Indicators A	Sociologically based system of Indicators B	Job based Systems of Indicators C
16	Satisfactory leave policy of the company	Yearly leave at least	Leave to join family fully for a while	Enough time to get refreshed again
17	satisfactory long-term benefit & insurance policies of the company	Insurance benefits of working with the company	Health protection and danger prevention	Hazard concerns covered by organization
18	satisfied with the existing salary structure of the company	Ok with payment time, procedure and amount	Enough pay considering nature of job	Good pay
19	satisfied with various activities in the firm & love participating in them	Work activities made sociable	Comfortable with activities	Interesting available activities to aid the job
20	happy with my work responsibilities	Good job prescriptions	Satisfied with responsibilities	Fair division of labour
21	The feel of being loved and belonging	Very socialized work place	Team loving themselves	Love environment
22	Safety and security	Safety of team a priority	Health hazard prevention	Good security consciousness
23	Personal interest and hobbies	Allowed to have fun while working	Allowed to make work fun	Allowed environment to unwind
24	Freedom to select team on special assignments	Allowance to choose who you can work with	Having a friendly relational team	Empowered to make team choices
25	Regular health hazard for all team members	Routine general tests	Ensuring the team is healthy	Keeping the team healthy
26	Allowed to try new things	Not on a tight leach	Allowed to try new methods	Freedom in taking new steps
27	Non-exhaustive work environment	Working but not overworked	Work without getting exhausted	Working without feeling used up

Table 1: System of Indicators to measure SWB of Candidates

Based on that we put forward a working assumption: each person can express his/her idea of SWB by placing ratings on basic indicators. The ambiguous meaning of the basic indicators of the verbal way of representing them, etc., makes the task of determining the actual value of an indicator for a candidate a rather difficult task. To solve it we will use the method of ranking verbal information, based on the natural multidimensionality of the interpretations of any indicator of SWB. We assume the following:

1) each indicator has several semantic contexts;
2) the context of the indicator depends on the context of the group of indicators to which it belongs;
3) in different groups, the same indicator has a different rating score (different rank of importance).

3. Introduction of Categories Used

For the semantic grouping of information (both primary and resulting from its processing - secondary) we introduce the concept of "category". A category is an element term that is used when verbally describing the procedure for forming a project team and acts as a system-assembling component for symbolic notation of concepts (categorical symbols) that are used in our method. To enumerate the formalized notation, we use the logic of the first appearance of a symbol, that is, the symbol that is then used is described first, which is then used in the description of subsequent input characters.

With the semantic concretization of information, which reflects the categorical symbols, in the future we will use the template shown in Fig. 1.

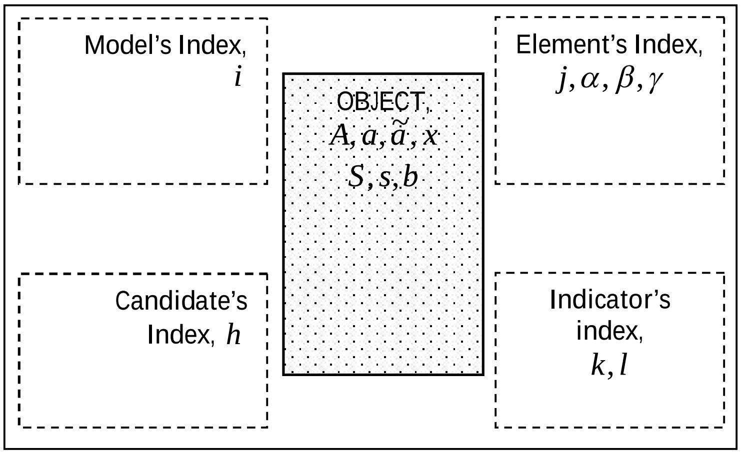

Figure 1: Placement scheme of object's indices

Category «Pretender/applicant»:

q – amount of candidates;

Q – set of numbers of candidates, $Q=\{1,2,...,q\}$;

h – Current number of a candidates, $h \in Q$.

Category «System model»:

n – amount of system models;

N – set of numbers of system models, $N=\{1,2,...,n\}$;

i – current number of a system model, $i \in N$;

${}^{i}A$ – i-system model, $i \in N$;

$\{{}^{1}A, {}^{2}A, ..., {}^{i}A, ..., {}^{n}A\}$ – the set of all system models.

A graphical representation of the system model is shown in Fig. 2 and utilized from [Rossoshanskaya O.V. (2000)].

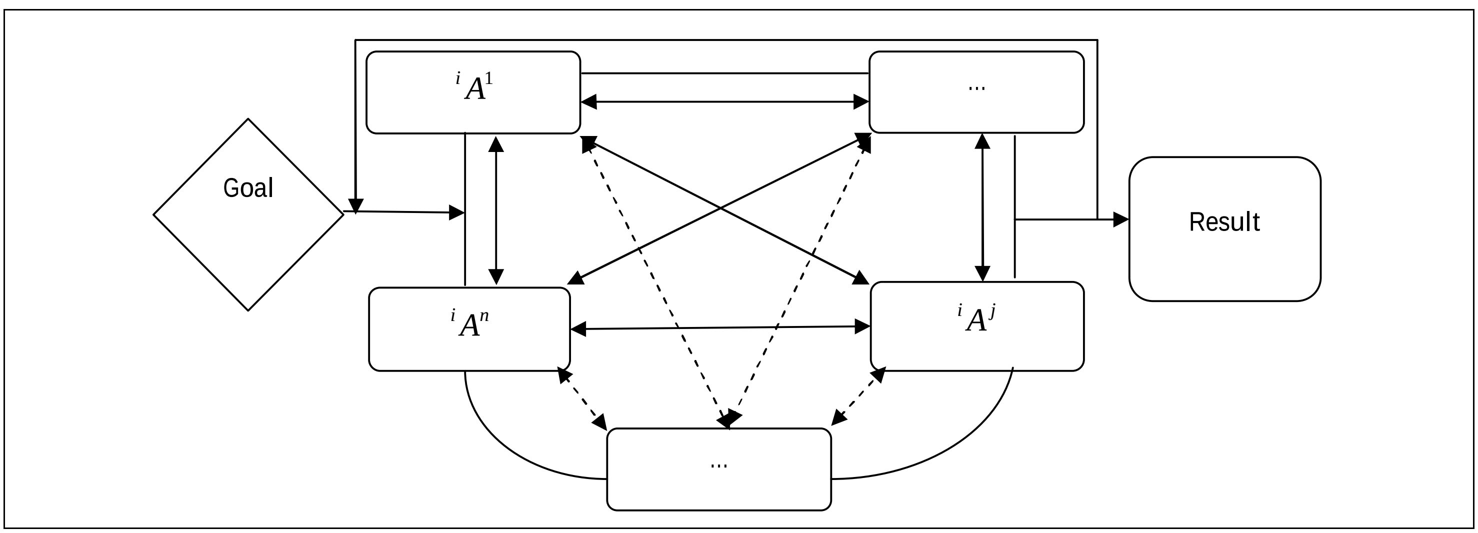

Figure 2: System model with n elements

Category «An element of a system model »:

m – number of elements in a system model *(the same for all system models, $m=4$)*;

M – set of elements' numbers in a system, $M=\{1,2,...,m\}$;

j – current number of an element from a system model, $j \in M$;

${}^{i}A^{j}$ – j-element in i-system model, $i \in N$, $j \in M$;

${}^{i}b$ – amount of connections between all elements in i-system model, $i \in N$;

$\left\{{}^{i}A^{1},{}^{i}A^{2},...,{}^{i}A^{j},...,{}^{i}A^{m}\right\}$ – set of all elements in i-system model, $i \in N$, $j \in M$.

Category «An indicator of a system model»:
s – number of indicators of a system model, *(the same for all system models,* $s = 27$ *)*;
S – set of numbers of indicators of a system models, $S = \{1,2,...,s\}$;
l – current number of an indicator of a system model, $l \in S$;
a_l – l- indicator of a system model, $l \in S$;
$\{a_1, a_2,...,a_l,...,a_s\}$ – set of all indicators of a system model, $l \in S$.

Category «Element's indicator in a system model»:
${}^{i}s^{j}$ – number of indicators in j-element in i-system model, $i \in N$, $j \in M$;
${}^{i}S^{j}$ – set of numbers of indicators of j-element in i-system model, ${}^{i}S^{j} = \{1,2,...,{}^{i}s^{j}\}$, $\bigcup_{j=1}^{m} {}^{i}S^{j} = S$, $i \in N$, $j \in M$
;
k – current number of an element's indicator of a system model, $k \in {}^{i}S^{j}$, $i \in N$, $j \in M$;
${}^{i}a_k^j$ – k-indicator of j-element in i-mode;, l – the number of this indicator in general list of indicators of a system model, $k \in {}^{i}S^{j}$, $i \in N$, $j \in M$;
$\left\{{}^{i}a_1^j,{}^{i}a_{2,}^j,...,{}^{i}a_k^j,...,{}^{i}a_{{}^{i}s^{j}}^j\right\}$ - set of all indicators of j-element in i-model, $k \in {}^{i}S^{j}$, $i \in N$, $j \in M$.

Matching/Alignment (match making, blending, correlation) of categories «An element of a system model», «An indicator of a system model» u «Element's indicator in a system model»:

$\forall i \in N$, $s = \sum_{j=1}^{m} {}^{i}s^{j}$ – number of indicators of any system model is equal to the number of indicators of j-element in i-system model;

$\forall i \in N$, $\{a_1, a_2,...,a_l,...,a_s\} = \bigcup_{j=1}^{m}\left\{{}^{i}a_1^j,{}^{i}a_{2,}^j,...,{}^{i}a_{{}^{i}s^{j}}^j\right\}$ – the set of all indicators of any system model is equal to union of sets of all indicators of j-element in i-model;

${}^{i}a_{k,l}^j$ – k-indicator of j-element in i-system model, l – the number of this indicator in the general list of indicators of a system model, $k \in {}^{i}S^{j}$, $i \in N$, $j \in M$, $l \in S$;

${}^{i}A^{j} = \left\{{}^{i}a_{k,l}^j\right\}$ – element of a system model ${}^{i}A^{j}$ is defined by the set of k-indicators ${}^{i}a_{k,l}^j$, $k = \overline{1,{}^{i}s^{j}}$, $i \in N$, $j \in M$, $l \in S$.

Fixing a candidate's choice of a system model:
${}_{h}^{i}A$ – i-system model has been chosen by a candidate h, $i = const$, $h = const$, $i \in N$, $h \in Q$;
${}_{h}^{i}A^{j}$ – j-element in i-system model that has been chosen by h-candidate, $i = const$, $h = const$, $i \in N$, $h \in Q$, $j \in M$;
${}_{h}^{i}a_{k,l}^{j}$ – k-indicator of j-element in i-system model that has been chosen by h-candidate, l – is the number of this indicator in general list of indicators in system model, $i = const$, $h = const$, $k \in {}^{i}S^{j}$, $i \in N$, $h \in Q$, $j \in M$, $l \in S$.

Category «An indicator of system model's element ranked by a candidate »:
${}_{h}^{i}\tilde{a}_{k,l}^{j}$ – k-indicator that has been ranked of j-element in i-model chosen by a candidate h, l – is the number of this indicator in general list of indicators in system model, $i = const$, $h = const$, $k \in {}^{i}S^{j}$, $i \in N$, $h \in Q$, $j \in M$, $l \in S$.

Category «Pair comparison of indicators' groups»:

α, β, γ – triplet of numbers of indicators' groups (model's elements), preference setting inputs, $\alpha, \beta, \gamma \in {}^{i}S^{j}$, $i \in N$, $j \in M$;

$\left\langle {}_{h}^{i}A^{\alpha}, {}_{h}^{i}A^{\beta}, {}_{h}^{i}A^{\gamma} \right\rangle$ – triad of elements of i-system model chosen by h-*candidate*, $i = const$, $h = const$, $\alpha, \beta, \gamma \in {}^{i}S^{j}$, $i \in N$, $h \in Q$, $j \in M$;

${}_{h}^{i}x^{\alpha\beta}$ – preference of indicators' group of elements ${}_{h}^{i}A^{\alpha}$ over group of indicators of element ${}_{h}^{i}A^{\beta}$ executed by candidate h;

${}_{h}^{i}x^{\beta\gamma}$ – preference of group of indicators of element ${}_{h}^{i}A^{\beta}$ over group of indicators of element ${}_{h}^{i}A^{\gamma}$ executed by candidate h;

${}_{h}^{i}x^{\gamma\alpha}$ – preference of group of indicators of element ${}_{h}^{i}A^{\gamma}$ over group of indicators of element ${}_{h}^{i}A^{\alpha}$ executed by candidate h;

${}_{h}^{i}x^{j}$ – strength of group of indicators of the element ${}_{h}^{i}A^{j}$ (the number of preferences);

${}_{h}^{i}c$ – the number of cyclical triads in i-system model that has been chosen by a candidate h.

3. Core Idea and Steps of the Method

The described categories allow to proceed to the description of the method. The method is based on the idea of considering basic indicators in different contexts. In our opinion, such contexts are chosen: social, working environment of activities, vital needs for Maslow. Each context is represented as a four-component system model frame-work. Each element of the system model is a group of indicators, and in each model the basic indicators for the four elements are grouped in different ways (both qualitatively and quantitatively) and correspond to the contextual logic of the particular system model.
The method assumes a consistent implementation of five steps (Figure 3).

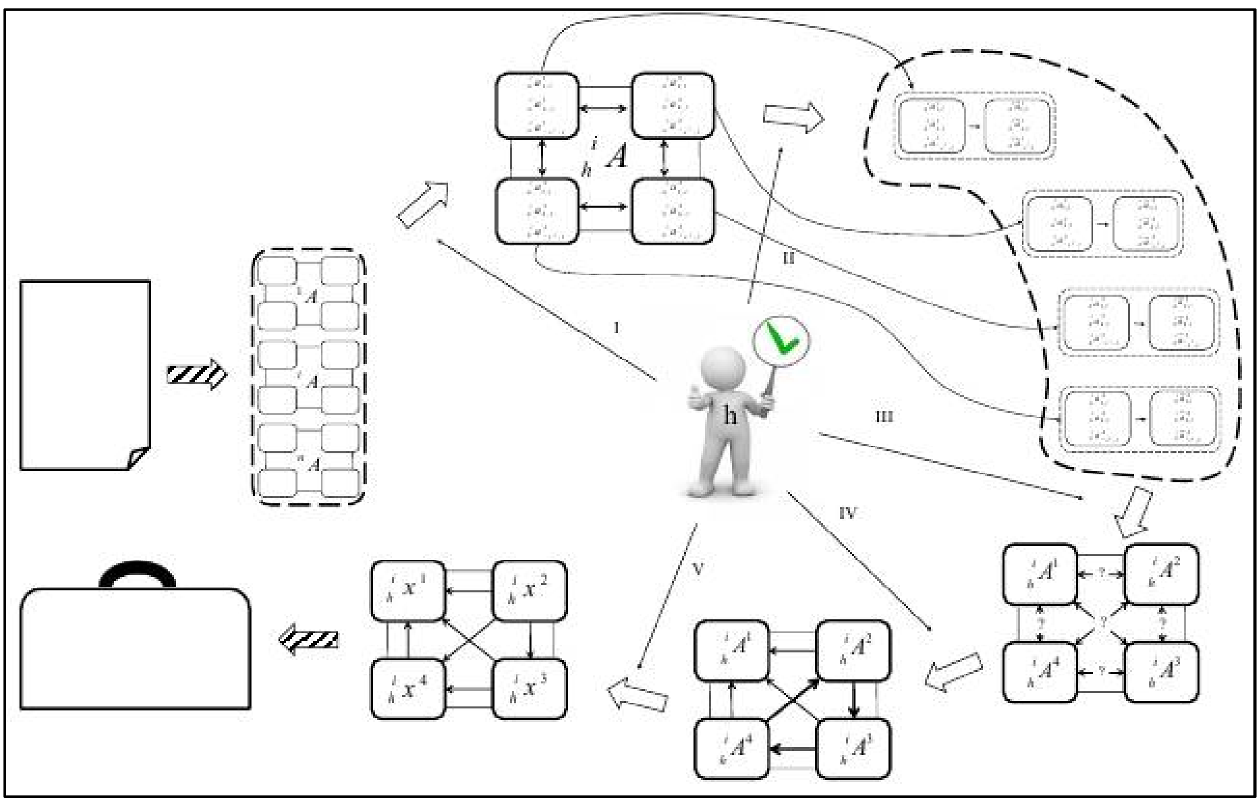

Figure 3: The conceptual model of the method of constructing a personal profile of the project team candidate based on the criteria of SWB based on ranked assessments

Let's consider each of these steps in more details.
Step 1. Selection of the most preferred system model from the candidate's values.

Let there are n system models, that contain equal number of elements (m) and equal amount of the same indices (s). These models describe the one whole, which was conditionally allocated from the real world in different contexts. Indices are spread through m elements of the model in different ways. The principle of the indicators distribution through the elements depends on the context of the model.

Based on the importance of a context every applicant of a project team chooses from n models the one that is more preferable for him or her.

Formally, the problem of choosing a system model can be formulated as follows.

Given:

${}^1A, {}^2A, ..., {}^iA, ..., {}^nA$ – the set of system models, $i = 1,2,...,n$, where n – the number of models. Let define the set N as the set of system models' numbers $N = \{1,2,...,n\}$.

Each ${}^iA$ model has the same amount of equal m elements ${}^iA^j$, $i = 1,2,...,n$, $j = 1,2,...,m$. Like set N, let define set M as the set of system elements' numbers $M = \{1,2,...,m\}$.In what follows we will consider four-elements models, $m = 4$.

The number of connections ${}^ib$ in model ${}^iA$ can be counted as ${}^ib(m) = m \cdot (m-1)/2$ (hereby, in four-elements model there are ${}^ib(4) = 4 \cdot (4-1)/2 = 6$ connections).

All system models contain the same number of indicators s, $s = 27$. $\{a_1, a_2,...,a_l,...,a_s\}$ – set of all indicators of the system model, $l \in S$, where S – set of system indicators' numbers, $S = \{1,2,...,s\}$.

Each ${}^iA^j$ element of the model contains its own amount ${}^is^j$ of indicators ($\forall i \in N$, $s = \sum_{j=1}^{m} {}^is^j$) and can be presented as the set (Fig.4).

System model's element ${}^iA^j$ is defined by the set of indicators ${}^iA^j = \{{}^ia^j_{k,l}\}$, where ${}^ia^j_{k,l}$ – k-indicator of j-element in i-system model, l – The number of this indicator in the general list of indicators of the system model, $k \in {}^iS^j$, $i \in N$, $j \in M$, $l \in S$.

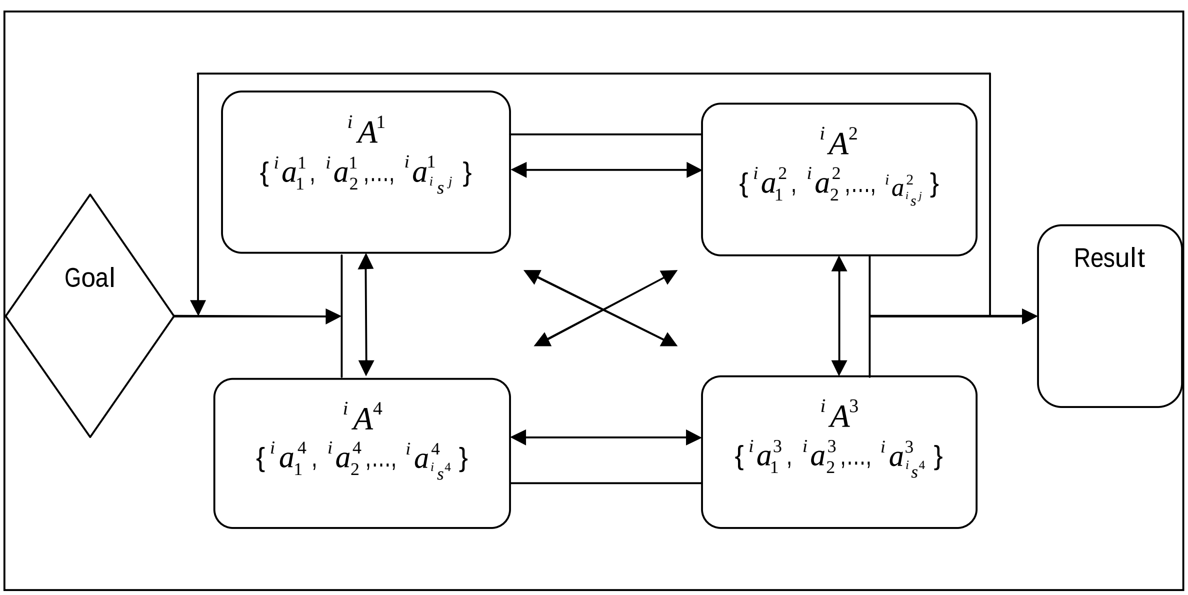

Figure 4: Four-elements system model ${}^iA$

Step 2. Ranking of indicators within each element of the selected system model.

After having chosen the most preferable model ${}^*A$, a candidate ranks indicators $\{..., {}^i_h a^j_{k,l}, ...\}$ of each j-elements of the model. Ranking of indicators is carried out by minimax method. *Let explain this problem:*

The element of the chosen model ${}^i_hA^j$ contains the initial list of indicators $\{..., {}^i_h a^j_{k,l}, ...\}$. According to the minimax method, the ranking occurs iteratively, and there is the following transformation of the indices:

1) The candidate is asked to determine the least valuable indicator from the whole set ${}^{*}s^{j}$ of indicators of j-element. In the ranked row this indicator has the last (largest) number:

$$ {}_{h}^{i}\tilde{a}_{{}^{i}s^{j},l}^{j} = \min\underbrace{\left\{\ldots,{}_{h}^{i}a_{k,l}^{j},\ldots\right\}}_{{}^{i}s^{j}\text{ indicators}} \rightarrow \left\{\ldots,\ldots,\ldots,\underbrace{{}_{h}^{i}\tilde{a}_{{}^{i}s^{j},l}^{j}}_{\text{ranked row}}\right\} $$

2) The selected indicator is removed from the initial list. This way, the remaining non-ranked row consists of $({}^{i}s^{j}-1)$ indicators. Then the applicant is asked to determine the most valuable indicator from the resulting set. This indicator has the first number in the ranked row:

$$ {}_{h}^{i}\tilde{a}_{1,l}^{j} = \min\underbrace{\left\{\ldots,{}_{h}^{i}a_{k,l}^{j},\ldots\right\}}_{({}^{i}s^{j}-1)\text{ indicators}} \rightarrow \left\{\underbrace{{}_{h}^{i}\tilde{a}_{1,l}^{j},\ldots,\ldots,{}_{h}^{i}\tilde{a}_{{}^{i}s^{j},l}^{j}}_{\text{ranked row}}\right\} $$

3) Then the procedure is repeated. The indicator selected in the previous step is deleted, and in the remaining set the applicant alternately determines the lowest and most valuable indicator:

$$ {}_{h}^{i}\tilde{a}_{{}^{i}s^{j}-1,l}^{j} = \min\underbrace{\left\{\ldots,{}_{h}^{i}a_{k,l}^{j},\ldots\right\}}_{({}^{i}s^{j}-2)\text{ indicators}} \rightarrow \left\{\underbrace{{}_{h}^{i}\tilde{a}_{1,l}^{j},\ldots,{}_{h}^{i}\tilde{a}_{{}^{i}s^{j}-1,l}^{j},{}_{h}^{i}\tilde{a}_{{}^{i}s^{j},l}^{j}}_{\text{ranked row}}\right\} $$

$$ {}_{h}^{i}\tilde{a}_{2,l}^{j} = \min\underbrace{\left\{\ldots,{}_{h}^{i}a_{k,l}^{j},\ldots\right\}}_{({}^{i}s^{j}-3)\text{ indicators}} \rightarrow \left\{\underbrace{{}_{h}^{i}\tilde{a}_{1,l}^{j},{}_{h}^{i}\tilde{a}_{2,l}^{j},\ldots,{}_{h}^{i}\tilde{a}_{{}^{i}s^{j}-1,l}^{j},{}_{h}^{i}\tilde{a}_{{}^{i}s^{j},l}^{j}}_{\text{ranked row}}\right\} $$

... till full transfer.

As a result, we get the ranked row $\left\{{}_{h}^{i}\tilde{a}_{1,l}^{j},{}_{h}^{i}\tilde{a}_{2,l}^{j},\ldots,{}_{h}^{i}\tilde{a}_{{}^{i}s^{j}-1,l}^{j},{}_{h}^{i}\tilde{a}_{{}^{i}s^{j},l}^{j}\right\}$, where ${}_{h}^{i}\tilde{a}_{1,l}^{j}$ – the most valuable indicator, and ${}_{h}^{i}\tilde{a}_{{}^{i}s^{j},l}^{j}$ – the least valuable indicator for the applicant.

Step 3. Pairwise comparison of groups of indicators of the elements of the system model.

At the next stage of profile construction, a candidate is asked to compare in pairs the groups of ranked indicators. The result can be presented as a table of preferences with two inputs α and β and composed of "ones" and "zeros":

1, if the group of indicators α is more preferable than the group of indicators β ($\alpha > \beta$),

0, if the group of indicators β is more preferable than the group of indicators α ($\alpha < \beta$).

Example. For a fixed number of i-system model when $m = 4$ the outcome of expressed preferences can be the following (Table. 2):

Group of indicators		β					Number of preferences, ${}_{h}^{i}x^{j}$
		${}_{h}^{i}A^{1}$	${}_{h}^{i}A^{2}$	${}_{h}^{i}A^{3}$	${}_{h}^{i}A^{4}$		
α	${}_{h}^{i}A^{1}$	–	0	1	1	→	2
	${}_{h}^{i}A^{2}$	1	–	1	0	→	2
	${}_{h}^{i}A^{3}$	0	0	–	1	→	1
	${}_{h}^{i}A^{4}$	0	1	0	–	→	1

Table 2: Example of a preference table for $m = 4$

Step 4. Check the preferences of the groups of indicators for consistency.

The main diagonal is free and the inputs (entrances/places) below, strictly speaking, are redundant. From the analysis of Table 1 on horizontal lines, the group of indicators ${}_h^iA^1$ is more preferable, than ${}_h^iA^3$ and ${}_h^iA^4$, but not than ${}_h^iA^2$. Let summarize the values in the table cells horizontally and get the total number of points for each group of indicators. Let mark it with ${}_h^ix^j$ – strength of group of indicators of element ${}_h^iA^j$ (the number of preferences given by h applicant in j-group of indicators in i-system model).

It is clear that the sum of such strengths is equal to the number of connections between the elements of the system model:

$$\sum_{j=1}^{m} {}_h^ix^j = {}^ib = \frac{1}{2}m(m-1) \quad (1)$$

And there are only $2^{\frac{1}{2}m(m-1)}$ different tables of preferences.

The geometrical representation of the comparison results is more obvious. Let apply the graph theory for the example given above. The figure has the form of a regular quadrangle, with all its connections (fig. 5, a). The direction of the arrows indicates six preferences. Therefore ${}^ix^j$ is equal to the number of arrows (Half-degree of the vertex outcome), coming out from the vertex ${}^iA^j$.

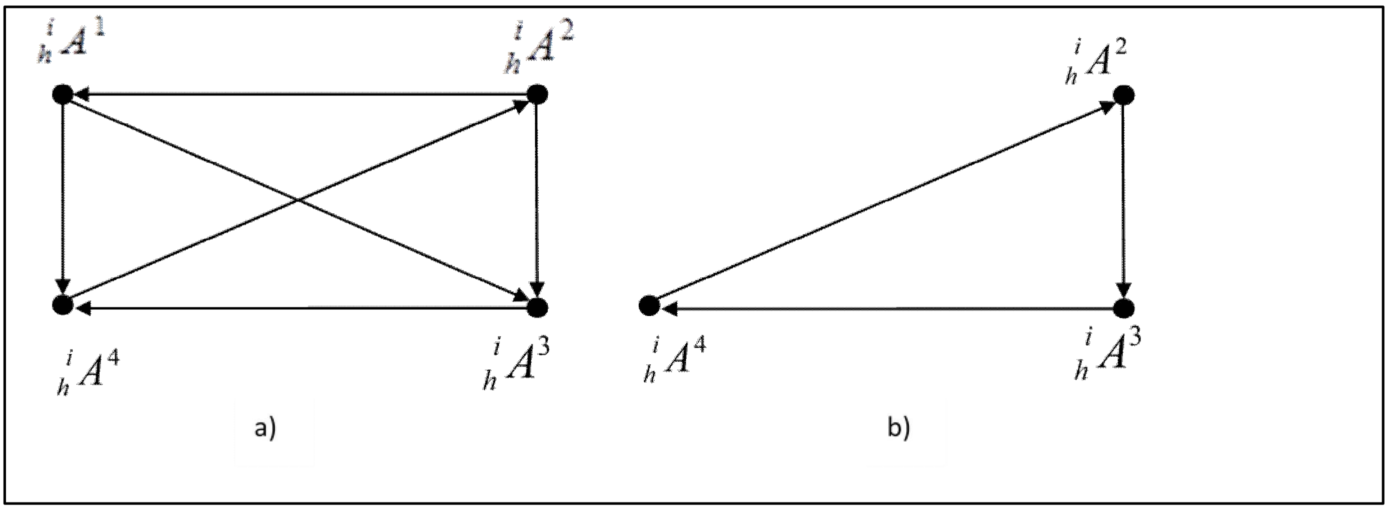

Figure 5: Graphical representation of comparison results
a) graph based on the data from the table 1
b) triad distinguished from the graph

The first question to be answered is whether the candidate is consistent in his or her judgments. For this, in the graphic representation of the comparison results, we need to distinguish the triads of elements with connections between them. Each allocated triad is analyzed for the presence of cyclicity in it (fig. 5, b). For a model with many elements, hence a large number of triads, the less cyclic triads are in them, the more consistent preferences' judgments can be considered.

For a group of three elements, the result of an inconsistent (unsound) candidate is a cyclic triad. For a large group, a big amount of judgments can be considered more consistent in case there will be as less cyclic triads as possible. Total number of triads is equal to the number of combinations of m with 3: $\frac{m!}{(m-3)!3!}$ (when $m = 4$ the number of triads is equal to $\frac{4!}{(4-3)!3!} = 4$).

For the considered variant of judgments, it is clear that with the four triads from our example the following $\left\langle {}_h^iA^2, {}_h^iA^3, {}_h^iA^4 \right\rangle$ and $\left\langle {}_h^iA^1, {}_h^iA^2, {}_h^iA^4 \right\rangle$ are cyclical triads. Number of cycles c is related to the number of points by the relation:

$${}_h^ic = \frac{1}{2}m(m-1)(2m-1) - \sum_{j=1}^{m} \frac{\left({}^ix^j\right)^2}{2}. \quad (2)$$

Let apply formula (2) to our example:

$$ {}_h^i c = \frac{1}{2} 4(4-1)(2\cdot 4-1) - \sum_{j=1}^{m}\left[\frac{2^2}{2}+\frac{2^2}{2}+\frac{1^2}{2}+\frac{1^2}{2}\right] = 7-5 = 2 .$$

The received answer coincides with our previous statements about the presence of two cyclic triads.

To identify the presence of cyclic triads on the basis of the preference table without analyzing the geometric model, we present the table in the form of a matrix.

General form of the matrix with the size $m \times m$, where m is the number of groups of indicators being compared will be:

$$\begin{pmatrix} {}_h^i x^{11} & {}_h^i x^{12} & \dots & {}_h^i x^{1\beta} & \dots & {}_h^i x^{1m} \\ {}_h^i x^{21} & {}_h^i x^{22} & \dots & {}_h^i x^{2\beta} & \dots & {}_h^i x^{2m} \\ \dots & \dots & \dots & \dots & \dots & \dots \\ {}_h^i x^{\alpha 1} & {}_h^i x^{\alpha 2} & \dots & {}_h^i x^{\alpha\beta} & \dots & {}_h^i x^{\alpha m} \\ \dots & \dots & \dots & \dots & \dots & \dots \\ {}_h^i x^{m1} & {}_h^i x^{m2} & \dots & {}_h^i x^{m\beta} & \dots & {}_h^i x^{mm} \end{pmatrix}.$$

For our example, the matrix has such form: $\begin{pmatrix} - & 0 & 1 & 1 \\ 1 & - & 1 & 0 \\ 0 & 0 & - & 1 \\ 0 & 1 & 0 & - \end{pmatrix}$.

Let construct the transitivity rule for the triad $\left\langle {}_h^i A^{\alpha}, {}_h^i A^{\beta}, {}_h^i A^{\gamma} \right\rangle$, where α, β, γ are any triple of indicators' numbers:

$$\forall \left\langle {}_h^i A^{\alpha}, {}_h^i A^{\beta}, {}_h^i A^{\gamma} \right\rangle : \quad {}_h^i x^{\alpha\beta} = 1 \wedge {}_h^i x^{\beta\gamma} = 1 \Rightarrow {}_h^i x^{\gamma\alpha} = 1 \Big| {}_h^i x^{\alpha\beta} = 0 \wedge {}_h^i x^{\beta\gamma} = 0 \Rightarrow {}_h^i x^{\gamma\alpha} = 0 .$$

From this rule, we can formulate a criterion for cyclicity in the triad:

The triad is cyclic if the transitivity rule is implemented.

This means that if the sum of the triad estimates $\left\langle {}_h^i A^{\alpha}, {}_h^i A^{\beta}, {}_h^i A^{\gamma} \right\rangle$ ${}_h^i x^{\alpha\beta} + {}_h^i x^{\beta\gamma} + {}_h^i x^{\gamma\alpha}$ *is equal to 0 or 3, then there is a cyclical triad. That is, the candidate is inconsistent in his or her judgments. If the sum of the estimates is equal to 1 or 2, then there is a cyclical triad, and the candidate is consistent in his or her judgments.*

The reasoning for the figures in the criterion (0 or 3, 1 or 2) can be easily seen by considering the model shown in Figure 6. By observing the clockwise rule when rounding the nodes, it is seen that if the bypass (rounding) arrow coincides with the model arrow, the comparison results' value in the matrix will be equal to 1, otherwise it is 0.

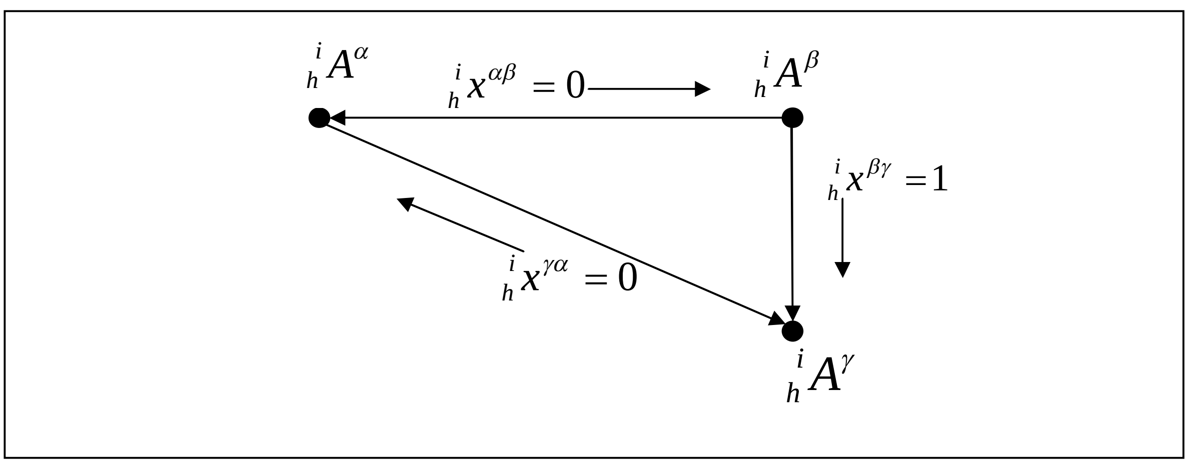

Figure 6: The sequence of selecting estimates from the preference table (the triad is not cyclical)

Step 5. Correcting the preferences of the elements of the system model.

Let's return to our example and list possible triads: $\left\langle {}_h^iA^1, {}_h^iA^2, {}_h^iA^3 \right\rangle$, $\left\langle {}_h^iA^1, {}_h^iA^2, {}_h^iA^4 \right\rangle$, $\left\langle {}_h^iA^1, {}_h^iA^3, {}_h^iA^4 \right\rangle$ and $\left\langle {}_h^iA^2, {}_h^iA^3, {}_h^iA^4 \right\rangle$. For each triad, the sum of the estimates can be calculated (table. 3).

Triad $\left\langle {}_h^iA^\alpha, {}_h^iA^\beta, {}_h^iA^\gamma \right\rangle$	Sum of estimates ${}_h^ix^{\alpha\beta} + {}_h^ix^{\beta\gamma} + {}_h^ix^{\gamma\alpha}$		Cyclicity
$\left\langle {}_h^iA^1, {}_h^iA^2, {}_h^iA^3 \right\rangle$	${}_h^ix^{12} + {}_h^ix^{23} + {}_h^ix^{31}$	0+1+0=1	No
$\left\langle {}_h^iA^1, {}_h^iA^2, {}_h^iA^4 \right\rangle$	${}_h^ix^{12} + {}_h^ix^{24} + {}_h^ix^{41}$	0+0+0=0	Yes
$\left\langle {}_h^iA^1, {}_h^iA^3, {}_h^iA^4 \right\rangle$	${}_h^ix^{13} + {}_h^ix^{34} + {}_h^ix^{41}$	1+1+0=2	No
$\left\langle {}_h^iA^2, {}_h^iA^3, {}_h^iA^4 \right\rangle$	${}_h^ix^{23} + {}_h^ix^{34} + {}_h^ix^{42}$	1+1+1=3	Yes

Table 3: An example of calculating the sum of triad estimates

To eliminate inconsistency in the applicant's answers, he or she is proposed to re-evaluate a couple of groups of indicators in each cyclic triad. To do this, in a cyclic triad it is necessary to select a pair, the change in which will not lead to cyclicity in other triads. In other words, if the estimate ${}_h^ix^{\alpha\beta} = 1$ Will be changed to the estimate ${}_h^ix^{\alpha\beta} = 0$, It is necessary to apply the cyclicity criterion to all triads that contain ${}_h^ix^{\alpha\beta}$.

In our example, we can change the estimate ${}_h^ix^{12} = 0$ for ${}_h^ix^{12} = 1$, then sum of estimates for the triad $\left\langle {}_h^iA^1, {}_h^iA^2, {}_h^iA^4 \right\rangle$ will be equal to 1+0+0=1. The same way ${}_h^ix^{23} = 1$ can be changed for ${}_h^ix^{23} = 0$, then sum of estimates for the triad $\left\langle {}_h^iA^2, {}_h^iA^3, {}_h^iA^4 \right\rangle$ will be equal 0+1+1=2. Estimates ${}_h^ix^{12}$ and ${}_h^ix^{23}$ are presented in triad $\left\langle {}_h^iA^1, {}_h^iA^2, {}_h^iA^3 \right\rangle$. After the changes, the sum of the estimates for it will not change: 1+0+0=1. Thus, we got rid of cyclicity without violating the criterion of cyclicity in other triads.

As a result, we get a new table of preferences (table 3) and a new preference polygon (fig. 7).

Table 3

Preference table with fixed pairs ${}_h^ix^{12}$ and ${}_h^ix^{23}$

Group of indicators	${}_h^iA^1$	${}_h^iA^2$	${}_h^iA^3$	${}_h^iA^4$	Points ${}^ix^j$
${}_h^iA^1$	–	1	1	1	3
${}_h^iA^2$	0	–	0	0	0
${}_h^iA^3$	0	1	–	1	2
${}_h^iA^4$	0	1	0	–	1

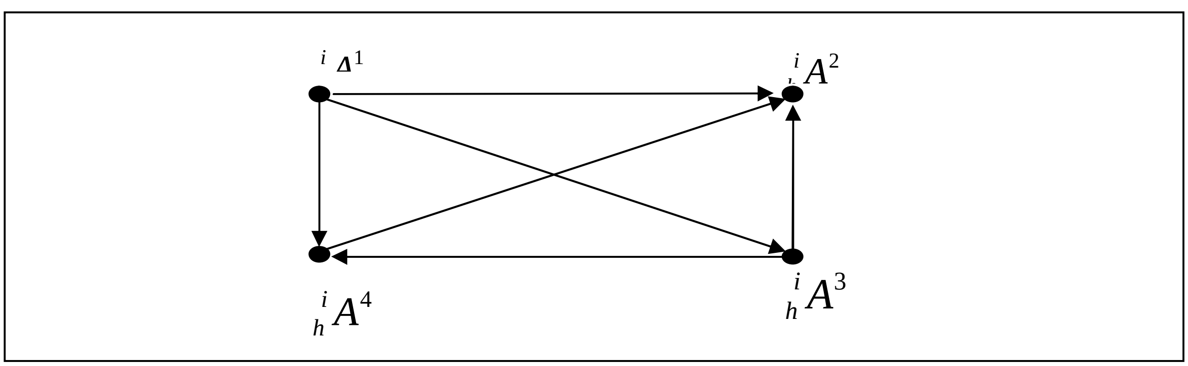

Figure 7: Polygon preference with fixed pairs ${}_h^ix^{12}$ and ${}_h^ix^{23}$

Similarly, without violating the cyclicality criterion, we can offer the applicant to change the preference ${}_h^i x^{24}$ and ${}_h^i x^{34}$. But the change of x^{41} will lead to the appearance of cyclicity in the triad $\left\langle {}_h^i A^1, {}_h^i A^3, {}_h^i A^4 \right\rangle$, therefore this pair of groups of indicators cannot be presented for reassessment.

Analysis of all methods to compare groups of indicators in pairs make it possible to reveal that there can be one or two cyclic triads in a four-element system model. In this case, the distribution of the number of preferences will be the following {3; 1; 1; 1} or {2; 2; 1; 1} accordingly. The options for placing such triads are shown in Figure 8. In the absence of cyclic triads, the distribution of preferences has the next form {3; 2; 1; 0}.

In the first case, when there is one cyclic triad (fig. 8, a), we can offer the applicant to change one preference in any pair of groups of indicators (${}_h^i x^{23}$ or ${}_h^i x^{34}$ or ${}_h^i x^{42}$). In this case, the preference values will be changed as follows:

${}_h^i x^1 = 3$, ${}_h^i x^2 = 0$, ${}_h^i x^3 = 2$, ${}_h^i x^4 = 1$, if to change the preference in the group ${}_h^i x^{23}$;

${}_h^i x^1 = 3$, ${}_h^i x^2 = 1$, ${}_h^i x^3 = 0$, ${}_h^i x^4 = 2$, if to change the preference in the group ${}_h^i x^{34}$;

${}_h^i x^1 = 3$, ${}_h^i x^2 = 2$, ${}_h^i x^3 = 1$, ${}_h^i x^4 = 0$, if to change the preference in the group ${}_h^i x^{42}$.

In the second case, when there are two cyclic triads (Figure 8, b), we can offer the candidate to change one preference that applies to both cyclic triads (${}_h^i x^{41}$), or in a pair of other preferences in the cyclic triads ([${}_h^i x^{12}$, ${}_h^i x^{34}$] or [${}_h^i x^{12}$, ${}_h^i x^{13}$] or [${}_h^i x^{34}$, ${}_h^i x^{42}$]). Preference values will change as follows:

${}_h^i x^1 = 3$, ${}_h^i x^2 = 2$, ${}_h^i x^3 = 1$, ${}_h^i x^4 = 0$, if to change the preference in the group ${}_h^i x^{41}$;

${}_h^i x^1 = 1$, ${}_h^i x^2 = 3$, ${}_h^i x^3 = 0$, ${}_h^i x^4 = 2$, if to change the preference in the pair of groups [${}_h^i x^{12}$, ${}_h^i x^{34}$];

${}_h^i x^1 = 0$, ${}_h^i x^2 = 3$, ${}_h^i x^3 = 2$, ${}_h^i x^4 = 1$, if to change the preference in the pair of groups [${}_h^i x^{12}$, ${}_h^i x^{13}$];

${}_h^i x^1 = 2$, ${}_h^i x^2 = 1$, ${}_h^i x^3 = 0$, ${}_h^i x^4 = 3$, if to change the preference in the pair of groups [${}_h^i x^{34}$, ${}_h^i x^{42}$].

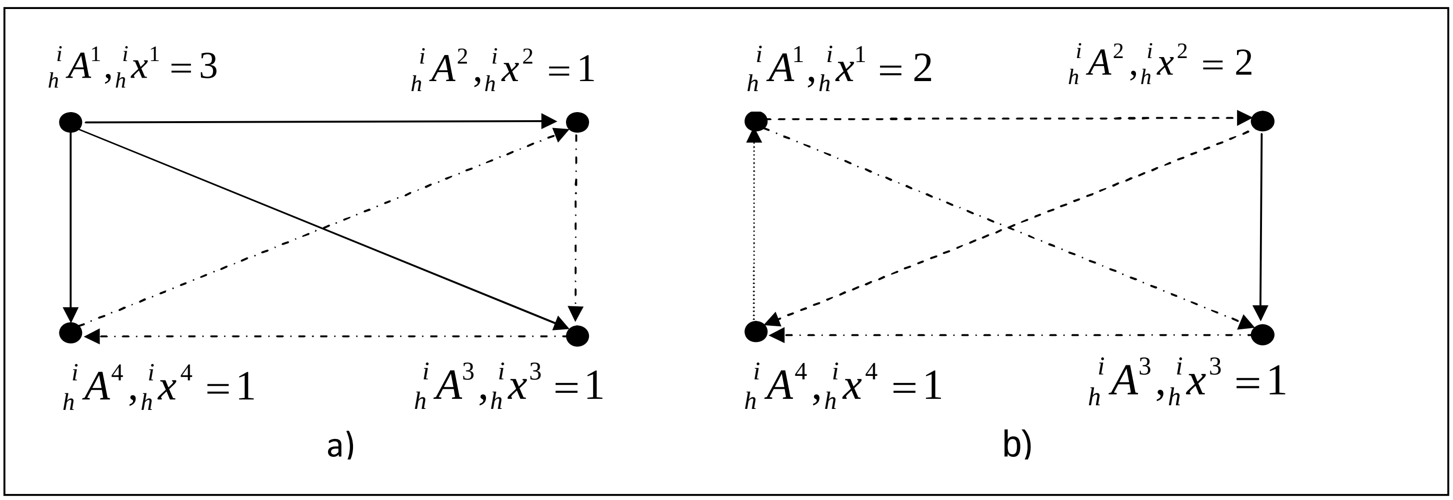

Figure 8: Variants of placement of cyclic triads in a four-element system model ${}_h^i A$: a) One cyclic triad; b) Two cyclic triads

After eliminating contradictions, we get an ordered series of groups of indicators. The basis of ordering is ${}_h^i x^j$ For each element ${}_h^i A^j$.

This information for each applicant is his/her personal profile on the criterion of SWB. It serves as a basis for solving the next task - the formation of a team on this criterion.

5. Further Research Perspectives

Having come this far in this research. We have been able to create a program to understand the subjective well-being ideology in candidates, what it takes to make them fulfilled and how to make it happen. As a result, we maximized team work successfully. Yet we will still take it steps further by developing and creating instruments that will enable not just individual selection but further group selections that will be used as models for creating project teams. The model will be used in creating project teams using the subjective well-being as a major criterion as well.

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