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Employees' Types of Intelligence Assessment Method in Accordance with the Elements of the Five-Factor Model Considering Life Cycle Stage

Abstract. Operational conditions of enterprises in the VUCA environment (Volatility, Uncertainty, Complexity and Ambiguity) are characterised by drastic changes in the socio-economic sphere, instability and high level of stress. An increasing number of scientific studies confirm the significant influence of socio-psychological factors on the productivity of an employee, so the task of their effective evaluation should be performed by the management of enterprises. The purpose of the article is to develop tools for evaluating the system of social and psychological indicators, based on the multiplicity of manifestation forms of employee's intelligence. The article presents the author's method of assessing the types of intelligence of employees according to the elements of the five-factor model, taking into account the stages of their life cycle. The proposed method consists of three consecutive stages: reconciliation of the results of the assessment methods application with each element of the five-factor model of the employee's intelligence using the wall method; establishment of connection between the stages of the life cycle, the amount of activity-productivity and the obtained results of elemental evaluation of types of intelligence, determining the reliability of the obtained research results by checking retested reliability and internal consistency (Cronbach's alpha coefficient). The article validates the choice of specific methods of assessing each type of employee intelligence based on the elements of the five-factor model. Application of the author's method was carried out at project departments of seven enterprises in the construction industry. The author's evaluation method was developed and tested for the purpose of further research in the influence of intelligence types of the five-factor model on the productivity of employees, taking into account the stages of their life cycle

Keywords: assessment tool, emotional intelligence, cognitive intelligence, social intelligence, physical intelligence, vitality quotient, employee life cycle

INTRODUCTION

Contemporary operational conditions of enterprises in the VUCA environment (Volatility, Uncertainty, Complexity and Ambiguity) and the processes of constant transformation of the social and labour sphere pose new challenges to enterprise management. Research in recent years [1-3] increasingly proves that not only the professional skills of an employee are valuable for employers but other abilities and personal qualities play an important role in a person's professional activity. It is the system of socio-psychological indicators and modern studies of the possibilities of human development in the professional sphere [4-6] that form the basis of effective motivational system.

In order to determine the main socio-psychological indicators that are key in shaping the productivity of an employee, scientists [7; 8] increasingly turn to the theory of multiple intelligences proposed by H. Gardner, in which the author suggested that the success of a person's life is determined not by the general type of intelligence, but by

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the multiplicity of its manifestation forms [7]. However, many contemporary researchers make their own corrections to the theory proposed by the author, simplifying or supplementing it with their own types of intelligence [9; 10].

In recent decades, the number of studies on the impact of certain types of intelligence on employee productivity has been increasing. One of the first researchers in this area was D. Goleman, who, by analysing professional lives of ninety-five graduates of Harvard University, using his own method of assessing the level of emotional intelligence (EQ), determined that the success of an employee depends on his knowledge (IQ), and 85% of success is determined by the employee's emotional intelligence [11]. The research conducted by him on the basis of more than 200 enterprises in different countries of the world confirmed that the difference in performance indicators for jobs (positions) of medium complexity is 67% dependent on the level of emotional intelligence of the employee (EQ), and only 33% on technical skills, professional knowledge, skills and cognitive abilities; and within top management, where the level of complexity is high, the impact of emotional intelligence is even greater and is 80%, while technical skills, skills and cognitive abilities constitute only 20% [11]. Confirmation of this theory is investigated in the works of a number of scientists [7; 12; 13].

Modern studies in the field of socialisation are increasingly focusing their attention on the study of social intelligence influence on the effectiveness of activities. The concept of "social intelligence" (SQ) was introduced by E. Thorndike in psychology in 1920, which the author defined as "activity in interpersonal relationships" [9]. In 1937, H. Allport singled out social abilities as individual personal qualities and properties in human activity and noted the high importance of the influence of this indicator on human life. In further studies of social intelligence, scientists [9; 14; 15] attribute the lion's share of research in the structure of intelligence to him. L.I. Uman defines social intelligence as practical thinking, giving it special importance in human activity [16]. In her research, M. Kubyshkina established a positive correlation between the level of social intelligence and high performance in interpersonal interaction [17]. E.Z. Ivashkevich identifies social adaptation and problem solving as the main function of intelligence [8].

With the introduction of the term "vitality quotient" (VQ) – the coefficient of vital energy, or, in other words, the ability to energise oneself and others, the opinions of scientists have somewhat changed. French psychologist Pierre Kass was one of the first to point out in his article in Forbes magazine that a high VQ is definitely more important than a high IQ or EQ, because it is the presence of vital energy that allows a person to develop other skills and competencies [10]. The coefficient of vital energy allows you to achieve your goals more effectively, while charging others with your enthusiasm [18]. However, it is worth noting that without a high level of IQ and EQ, it will be much more difficult to do this, because it is thanks to them that a person is able to manage, direct and distribute his own energy resources in accordance with the goals. It is important that this indicator can be used not only at the individual level, but also at the level of teams, organisations, or at even more extent global level.

A number of scientists [19; 20] in their works note the importance of researching the level of physical intelligence (PQ) in various fields of activity. Although determining influence of PQ level, i.e., physical endurance and health of a person, on his productivity has always been obvious, today researches in the field of the influence of healthy behavior and physical activity on the quality of professional training and indicators of competitiveness are gaining special importance [19]. As noted by researchers L.O. Popov, V.M. Sokrut, G.L. Apanasenko and others, today medical science and society in general are beginning to realise that achieving an optimal level of health is not possible only by treating diseases, because "health is not only the absence of diseases, but it is also a state of complete well-being..." [21]. That is, outdated methods become not only ineffective, but also unpromising in achieving the main goal. Strengthening and preserving health of a person, and in our study, health of an employee, is an important task of the management system.

The main goal of the article is the development of tools for assessing types of employee intelligence, which form a system of key socio-psychological indicators.

MATERIALS AND METHODS

In order to form a system of socio-psychological indicators, which are key in shaping employee performance, we used the author's five-factor model of employee intelligence, which links basic types of intelligence (EQ, IQ, SQ, VQ, PQ) with employee performance [22], and is based on the theory of multiple intelligences of G. Gardner. In order to form a qualitative system of social and psychological assessment, we made a selection among the existing methods of assessment of each type of intelligence of the five-factor model.

Among the wide selection of methods for evaluating the level of emotional intelligence (EQ), to date, the author's objective test of J. Mayer, P. Salovey and D. Caruso, which is used in modern research by many scientists, has become the most widespread. This technique was developed on the basis of the four-component structural model of abilities proposed by the authors, and includes two subtests for each component of emotional intelligence of the specified model, namely:

- perception, evaluation and expression of emotions (identification of emotions);
- the use of emotions to increase the efficiency of thinking;
- understanding and analysis of emotions;
- conscious management of emotions for personal growth and improvement of interpersonal relations [23].

It is also worth giving special importance to innovative technologies in the field of emotional intelligence, notably, emotional artificial intelligence, which, through awareness of one's own emotional abilities, contributes to the professional self-improvement of the employee [24].

The first researcher who proposed to study social intelligence (SQ) as an object of measurement was J. Gilford.

The author, together with M. O'Sullivan, developed a test for measuring social intelligence, which includes four subtests aimed at diagnosing four abilities in the structure of social intelligence: knowledge of classes, systems, transformations and behavioural results [25]. Today, this method of assessing the level of social intelligence is the most developed and accurate.

Several versions of tests for determining the level of vital energy (VQ) are available online today, but in practice, the author's method of Oksana Chekhova – HR expert and consultant on organisational development and personnel development – is used quite often. The proposed method consists of three parts: test questions, subjective assessment of the interviewee and solving mini cases [26].

In practical medicine, the system of assessing the level of physical health (PQ) is based on a general examination of a person and, in the absence of signs of disease or certain physical defects, a diagnosis of "healthy" is made. However, this method is too simplistic. In order to determine the level of physical health and its impact on employee productivity, we used the term "amount of health" proposed by M.M. Amosov. The author defines somatic health as a certain functional reserve that ensures the productivity of the functioning of all organs and systems, determines the speed of adaptation of the organism to environmental conditions, and can be measured by specific indicators or parameters [20].

A number of authors [27; 28] in their studies of assessment of working capacity and physical endurance use the term "physical development of a person", which is defined as a complex of morphological and functional properties of the body. Assessing the level of physical development of a person makes it possible to assess physical strength and endurance, productivity, volume and nature of physical exertion.

Many authors offer their own methods of assessing the level of health. P. Ramzaeva singles out four main criteria in the evaluation system: life expectancy; time integral of physical and mental capacity; the ability to reproduce healthy offspring; integral of well-being (over a lifetime) [29]. V. Zaitseva notes that physical health can be assessed with the help of tests, using the main five morphological and functional indicators: Quetelet index (level of mass and growth development); Robinson's index (quality of regulation of the cardiovascular system); Skybynskyi index (functional capabilities of respiratory and circulatory organs); Shapovalova index (level of development of motor qualities – strength, speed, endurance, as well as functional capabilities of the cardiorespiratory system); Ruffier index (level of adaptation reserves of the cardio-respiratory system) [30].

The majority of authors [31; 32] in the field of research on methods of assessing human physical development note that the most accurate and optimal in various fields of research are questionnaire and test methods of assessment. For this purpose, we have chosen the method of assessing the employee's physical health based on the method of determining biological age, proposed by E.L. Mykhalyuk et al. [33]. This technique consists of objective (anthropometric and functional indicators) and subjective (questionnaire data) assessment systems.

In order to evaluate the types of intelligence of employees according to the elements of the five-factor model, taking into account the stages of their life cycle, we have developed an appropriate method using existing methods. The author's method consists of three consecutive stages. At the first stage, individual types of intelligence of the five-factor model are assessed using the following methods:

1. The level of emotional intelligence (EQ) is determined using our adapted test MSCEIT V2.0 (J. Meyer et al.) [34]
2. Evaluation of the level of social intelligence (SQ) – using the test of J. Gilford & M. O'Sullivan [25].
3. Determination of the coefficient of vital energy (VQ) by the author's method of Oksana Chekhova [26].
4. Assessment of the level of physical intelligence (PQ) by the method of calculating biological age (E.L. Mykhalyuk et al.) [20; 33].

Determination of the level of cognitive intelligence (IQ) using one of the most researched and widespread methods – the classic test of the English psychologist H. Eysenck [35].

To simplify and unify test scores, it is suggested to use the system of dynamic walls from 1 to 9 [36]. At the second stage, using MS Excel software, the obtained test results are analysed and the relationship between the stages of the life cycle, the amount of activity-productivity and the obtained results of the element-by-element assessment of types of intelligence is established. At the third stage, the reliability of the obtained research results is determined by retesting and calculating the Cronbach's alpha correlation coefficient.

The proposed method was tested at project departments of seven enterprises in the construction industry. The research sample of the project department of enterprise A consisted of 14 employees, at enterprise B – 12 employees, at enterprise B – 9 people, at enterprise D – 19, at enterprise D – 17, at enterprise E – 14, at enterprise Z – 20 interviewed employees. In general, the sample consisted of 105 people. The surveyed employees passed five types of tests to determine their levels of IQ, EQ, VQ, PQ and SQ, respectively. In order to reduce the burden on the respondents, each test was conducted on a separate day, accordingly, the period of the conducted research was five days. To check the reliability of the obtained results, we conducted a repeated study in a month. The management of the enterprises provided the data on the number of projects completed by each employee within three months, including the period of the study.

RESULTS AND DISCUSSION

Let's have a look at the results of the test of the proposed method.
Stage I. Application of the walls method for matching the results of element-by-element assessment of types of intelligence according to the five-factor model. The obtained results of the assessment of each type of intelligence of the five-factor model are translated into dynamic walls from 1 to 9, which are calculated by determining the minimum value from the range of received data (Omin) and the maximum (Omax). Next is the value δ=(Omax–Omin)/9. Values greater than Omax correspond to the 9th wall, values smaller than Ohmin correspond to the 1st wall, and between them there are other walls with a step [36] (Table 1-5).

Table 1. Results of transfer of points into IQ walls

Walls	1	2	3	4	5	6	7	8	9
Range	0-17	18-34	35-52	53-70	71-88	89-106	107-124	125-142	143-160

Source: developed by the authors based on [36]

Table 2. Results of transfer of points into EQ walls

Walls	1	2	3	4	5	6	7	8	9
Range	0-0.1	0.1-0.2	0.2-0.3	0.3-0.4	0.4-0.5	0.5-0.6	0.6-0.7	0.7-0.8	0.8-0.9

Source: developed by the authors based on [36]

Table 3. Results of transfer of points into SQ walls

Walls	1	2	3	4	5	6	7	8	9
Range	0-6	7-12	13-18	19-25	26-31	32-37	38-43	44-49	50-55

Source: developed by the authors based on [36]

Table 4. Results of transfer of points into PQ walls

Walls	1	2	3	4	5	6	7	8	9
Range	2.0-1.78	1.77-1.56	1.55-1.34	1.33-1.12	1.11-0.9	0.89-0.68-	0.67- 0.46	0.45-0.23-	0.22-0

Source: developed by the authors based on [36]

Table 5. Results of transfer of points into VQ walls

Walls	1	2	3	4	5	6	7	8	9
Range	0-0.1	0.1-0.2	0.2-0.3	0.3-0.4	0.4-0.5	0.5-0.6	0.6-0.7	0.7-0.8	0.8-0.9

Source: developed by the authors based on [36]

The obtained body of information ensures the comparability of the results of the assessment of various types of intelligence using various methods. Within our research, an important factor that must be taken into account is the periodisation of the employee's activity. Since each period in the employee's activity has different conditions, goals and motivation, accordingly, the impact of certain types of intelligence on the productivity of the activity will also be different. For this purpose, we have identified a number of main interdependent stages of the employee's life cycle [37], namely: hiring (first), socialisation (second), labour activity (third), training and evaluation (fourth), professional realisation and growth (fifth), dismissal (sixth). It is important to note that the defined cycle is repeated multiple times, except in cases of retirement or other reasons for termination of the employee's employment.

Stage II. Establishing a relationship between the stages of life cycle, the amount of activity-productivity and the obtained results of element-by-element assessment of types of intelligence according to the five-factor model in walls. In order to group and analyse the received body of information, we created tables using MS Excel software. Using the sorting function of MS Excel software, we created data tables that represent the relationship between employees at a certain stage of their life cycle, their performance and the results of wall tests. At this stage, we evaluated six groups of employees who are at different stages of their life cycle. The number of employees in the first stage of the life cycle is 10, in the second – 20, in the third – 17, in the fourth – 21, in the fifth – 25 and in the last sixth stage – 12 employees.

Using function wizard as one of MS Excel software modules, the maximum (MAX) and minimum (MIN) value of the general sample productivity of employees was calculated, which is 1 unit and 14 units, respectively. The average value of activity-productivity (AVERAGE) of the total sample is 8 units. Also, using the AVERAGE function, the average value of indicators (productivity of activity; test results transferred to walls) was calculated for each group of employees, taking into account the stages of their life cycle.

Table 6 shows the average values of the obtained results of the study of the five-factor model of intelligence, taking into account the stages of the employee's life cycle.

Table 6. Average values of the results of the five-factor model of intelligence, taking into account the stages of the employee's life cycle

Life cycle stage	Group of employees, people	Productivity of activity	Types of intelligence according to the elements of the five-factor model, walls				
			IQ	EQ	SQ	PQ	VQ
First	10	5.80	6.30	6.60	5.40	5.40	5.90
Second	20	6.70	5.0	5.85	6.25	5.35	6.15
Third	17	6.47	5.59	5.71	5.53	6.35	5.12
Fourth	21	9.62	5.57	6.38	5.43	5.86	5.67
Fifth	25	9.20	6.52	6.32	5.28	5.44	5.64
Sixth	12	8.00	5.00	5.75	5.25	6.08	5.92

Source: designed by the authors using MS Excel software

The group of employees who are at the first stage of their life cycle, i.e. undergoing an internship, are on a probationary period, or have just moved to a new position, consists of 10 people and are characterised by a sufficiently high level of emotional and cognitive intelligence. The value of the levels of physical, social and energetic intelligences is at an average level in the range of 5.4-5.9. This stage is characterised by a high level of stress due to uncertainty and new working conditions. The performance of each worker in the group varies significantly, with a mean of 5.8, which is below the mean for the total sample.

The analysis of the results of testing of a sample of employees who were at the second stage of their life cycle, that is, they were undergoing a period of socialisation, shows high indicators of the level of vital energy and the level of socialisation. At this stage, adaptation of employees to the new team, familiarisation with new rules, ethics and etiquette takes place. It is worth noting that the level of activity productivity in the group of employees is higher than that of employees in the first stage of the life cycle, but it is lower than the average value of this indicator of the total studied sample.

The third stage of the life cycle is labour activity. According to the results of the study, all obtained indicators of the assessment of types of intelligence according to the elements of the five-factor model are above the average level, however, the highest value corresponds to the level of physical and emotional intelligence. Therefore, the basis of this stage of the life cycle is the fulfillment of labour obligations, which requires a high level of physical intelligence. The average value of the productivity of the group of employees, who are in the third stage of their life cycle, is also below the average value of this indicator of the total studied sample.

The group of employees who are at the fourth stage of their life cycle consists of 21 people and is characterised by a sufficiently high level of emotional intelligence. Also, among the studied sample of respondents, the activity-productivity index in this group of employees is the highest.

The largest number of people in the total studied sample belongs to the fifth group of employees and is 25 people. This group is characterised by a high level of emotional and cognitive intelligence, as well as a fairly high level of activity productivity, which is higher than the average value of the general studied sample.

The sixth stage is the final stage of the cycle. In this period of activity, employees are either at the stage of transition to the next cycle (promotion, change of place of work, type of activity, etc.), or at the stage of completion of labor activity (retirement, or other reasons). Some of the workers who are at the sixth stage of the life cycle have a rather low level of vital energy, which may indicate emotional burnout under the influence of a number of factors: work, social or psychological [27], dissatisfaction with the workplace, or a desire to end work. That group of employees, for whom the level of vital energy remains high, are at the stage of transition to the next cycle, i.e., promotion, change of workplace, etc. Such a sample of employees is characterised by a sufficiently high level of physical development and vital energy. The average indicator of the performance of the studied sample at this stage coincides with the average value of the general sample.

Stage III. Checking retested results proving reliability of the method. In order to check the reliability of the obtained results, we conducted a repeated study a month later. The obtained results of retested reliability studies are shown in Table 7.

Table 7. Value of r-Pearson correlation coefficients of retested reliability indicators

Life cycle stage	Correlation coefficient (r)					Level of significance(p)				
	IQ	EQ	SQ	PQ	VQ	IQ	EQ	SQ	PQ	VQ
First	0.70	0.88	0.91	0.90	0.78	0.01	0.01	0.01	0.01	0.01
Second	0.84	0.76	0.83	0.86	0.91	0.01	0.05	0.01	0.01	0.01
Third	0.68	0.87	0.77	0.69	0.88	0.01	0.01	0.01	0.01	0.01
Fourth	0.81	0.80	0.74	0.88	0.69	0.01	0.01	0.01	0.05	0.01
Fifth	0.84	0.72	0.89	0.80	0.74	0.01	0.01	0.01	0.01	0.01
Sixth	0.73	0.69	0.83	0.78	0.83	0.01	0.05	0.01	0.01	0.01
Cronbach's alpha coefficient	0.91	0.89	0.96	0.94	0.9	–	–	–	–	–

Source: designed by authors

Based on the obtained data, it was established that the results of the study are characterised by high reliability, since the range of values of r-Pearson correlation coefficients when assessing retested reliability at individual stages of the life cycle is in the range of 0.68-0.91. The obtained indicators of the Cronbach alpha correlation reliability coefficient are in the range of 0.89-0.97, which also confirms the high reliability of the obtained research results.

Figure 1 shows the dynamics of the values of the types of intelligence according to the elements of the five-factor model in walls and the productivity of groups of employees, taking into account the stages of their life cycle.

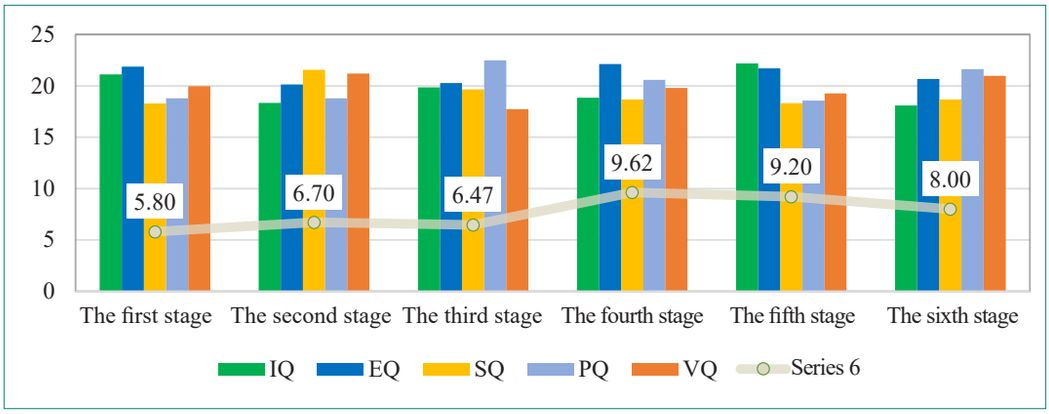

Figure 1. The dynamics of the values of the types of intelligence according to the elements of the five-factor model, expressed in walls, and the productivity of the activities of groups of employees, taking into account the stages of their life cycle

Source: designed by authors

The given grapth makes it possible to clearly track the significant increase in the productivity of activities in the fourth and fifth stages of the life cycle. The fourth stage of the life cycle corresponds to the period of training and evaluation of employees, a high level of activity-productivity indicates high motivation of employees at this stage, since the results of the employees' activities will affect the results of their certification. The high level of activity productivity at the fifth stage of professional realisation and growth is justified by the improvement of the level of qualifications of employees. Also, at the specified stages of the life cycle, a high level of emotional literacy and cognitive intelligence is observed (Table 6).

So, as a result of the conducted research, the author's method of assessing the types of intelligence of the employee according to the elements of the five-factor model is proposed. Unlike the existing ones, the proposed method provides a comprehensive approach to the formation of data for making management decisions. Based on the results of the study, the priority types of employee intelligence at each stage of the life cycle were identified, which should be paid attention to by the management of enterprises when planning labour productivity.

CONCLUSIONS

Today, the influence of socio-psychological factors on the productivity of employees is of leading importance. That is why theoretical-methodical and practical studies provide the management of enterprises with the tools necessary for successful functioning of the business. Developed as a result of our research, the tool for evaluating the types of employee intelligence based on the elements of the five-factor model, taking into account the stages of their life cycle, will allow the management of enterprises to apply socio-psychological management methods on a scientific basis.

The developed method is complex in nature and requires compliance with a certain algorithm of actions. As a result of approbation of the proposed method at the first stage with the help of the method of dynamic walls, a system of unified evaluation data of the five-factor model was obtained for individual types of intelligence of employees in walls. At the second stage of the proposed evaluation method, the relationship between the value of activity-productivity and the average values of the obtained results of elemental evaluation of the types of intelligence of groups of employees at different stages of their life cycle was investigated. It is important to note that employees who are at the stages of training and professional realisation are characterised by the highest level of productivity and high indicators of the level of emotional intelligence, which indicates the interrelation of these indicators at these periods of the life cycle. The values of the r-Pearson correlation coefficients obtained at the third stage in the assessment of retested reliability and Cronbach's alpha correlation coefficient indicators confirmed the high reliability of the obtained research results.

The dynamics of the obtained indicators made it possible to establish the priority types of intelligence of employees at each stage of their life cycle, which should be paid attention to by the management of enterprises when making management decisions. The purpose of further research is to establish the influence of types of intelligence according to the elements of the five-factor model on the productivity of employees, taking into account the stages of their life cycle.

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Метод оцінки видів інтелекту працівників за елементами п'ятифакторної моделі з урахуванням етапів життєвого циклу

Анотація. Умови функціонування підприємств в середовищі VUCA (Volatility, Uncertainty, Complexity and Ambiguity) характеризуються радикальними змінами у соціально-економічній сфері, нестабільністю та високим рівнем стресовості. Усе більша кількість наукових досліджень підтверджують значний вплив соціально-психологічних факторів на продуктивність діяльності працівника, тому перед керівництвом підприємства постає завдання їх ефективного оцінювання. Метою статті є розробка інструментів оцінки системи соціально-психологічних показників, заснованої на множинності форм прояву інтелекту працівника. В статті представлено авторський метод оцінки видів інтелекту працівників за елементами п'ятифакторної моделі з урахуванням етапів їх життєвого циклу. Запропонований метод складається із трьох послідовних етапів: узгодження результатів застосування методик оцінювання кожного елементу п'ятифакторної моделі інтелекту працівника із застосуванням методу стенів; встановлення зв'язку між етапами життєвого циклу, величиною продуктивності діяльності та отриманими результатами поелементного оцінювання видів інтелекту; визначення надійності отриманих результатів дослідження шляхом перевірки ретестової надійності та внутрішньої узгодженості (коефіцієнт альфа Кронбаха). У статті обґрунтовано вибір конкретних методик оцінки кожного виду інтелекту працівника за елементами п'ятифакторної моделі. Апробація авторського методу проводилась на базі проектних відділів семи підприємств будівельної галузі. Авторський метод оцінки розроблено та апробовано з метою подальших досліджень впливу видів інтелекту п'ятифакторної моделі на продуктивність діяльності працівників з урахуванням етапів їх життєвого циклу

Ключові слова: інструмент оцінки, емоційний інтелект, когнітивний інтелект, соціальний інтелект, фізичний інтелект, коефіцієнт життєвої енергії, життєвий цикл працівника