Remote Selection of Staff Based on Socionic Analysis of Social Network Content

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Abstract

In modern conditions, the ability to work remotely is becoming increasingly important. On the other hand, the limited possibility of direct contact with candidates for a job highlights the ability and skills that someone has when finding skilled workers using remote sensing techniques. In particular, this applies to the assessment of soft skills of applicants, which include high communication skills, language skills, cognitive or emotional empathy, leadership traits. Thus, recruitment managers must have clear criteria for remote assessment of the business qualities of potential employees. As such criteria, the authors recommend the use of the Jung basis. With the help of four pairs of dichotomous features with a high probability, the mentality of a person is determined and on this basis, their ability to be involved in performing a certain type of work is assessed. To do this, the authors propose to use the following methods of analysis: visual, verbal, and if possible - and testing. The study also describes the algorithm for using these methods to form teams, assess their cohesion, and determine the optimal leader. It is suggested to use photos and text messages from social networks as a source of information for such analysis. This type of information is publicly available and quite informative. In addition, such information can be monitored and analyzed without the knowledge of social network users applying for the job. The advantage of the proposed methods is their relative simplicity and accessibility in use. The novelty of the proposed method is the possibility of remote selection of staff, which does not require direct contact with candidates and saves time. This provides significant benefits both during a pandemic and when organizing remote staff work, without specific office space. Psychological compatibility of staff will play a key role. However, it should be noted that they also require sufficient qualified knowledge in the field of practical psychology and significant practical experience of the expert.

Keywords

Web communities, social networks, socionic analysis, sociometry, commands, visual assessment, verbal assessment, Jung basis.

1. Introduction

Over the past year, we have faced a problem where interpersonal and organizational communications, including oral live communication, have been limited due to the coronavirus pandemic. Therefore, the task of organizing and supporting business communications, selecting candidates for vacant positions and creating capable work teams, remotely, has become very important.

One of the ways to find the best candidates for vacant positions, create effective teams remotely, in such conditions of limited access to information about the participants themselves, can be socionic diagnostics of content from social networks (including photo content and text messages). Analysis of

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photos and text messages makes it possible with a high probability to determine the sociotype of each applicant. Having information about the sociotype of the applicant and the vacancy and the type of work that needs to be done, it is possible with high probability to predict which candidates to invite to vacant positions. Also, based on the analysis of the collected information and socionic diagnostics, it is possible to select a capable working team in a short time to perform tasks remotely.

To do this, you must meet the following criteria:

- to determine as accurately as possible the sociotype of applicants for vacant positions;
- form work teams based on the principle of comfort for all its members.

First of all, the task is to determine the sociotype of each applicant using the Jung basis. Of the three main methods of determination - visual, verbal and testing, without direct contact with the subject, we can use only the first two methods. If we can confirm the visual information with verbal messages, it allows us to move to the active phase - the interview.

If the candidates themselves are interested in working in a team where they will be most comfortable, they have the opportunity to fill out a questionnaire to determine their sociotype. If we get identical results based on all these methods, then determining the sociotypes of candidates for vacant positions and for teamwork will be correct.

The next stage is the formation of a capable team. In order for a team to function effectively remotely, it is important to consider the psychological compatibility of the members of that team. Since it is very important that each team member clearly understands the tasks he has to perform and what his personal contribution is to these tasks, it is necessary to analyze the intertype relationships that develop between team members within. Such an indicator of the comfort of being in this team is the personal coefficient of conflict between the candidates and the team as a whole.

Determining the coefficient of conflict is proposed by analyzing the psychological distances of intertype relationships between team members. After the information about the applicants is collected and processed mathematically, based on the following data analysis, the selection of the optimal leader or team leader is carried out.

2. Related Works

Problems of sociometric analysis of groups and communities, various aspects of personnel selection, are widely covered in scientific papers. The article by Ion Georgiou, Ronald Concer, Andrej Mrvar offers a method of analyzing the compatibility and diversity of different, interconnected, structural configurations of groups that are focused on achieving a specific goal. In particular, scientists consider an approach that meets sociometric principles and methodological and measurement standards [1]. Current issues of team formation, based on sociometric analysis of social networks, are considered in [2]. Researchers offer their method of solving the problem of finding a set of paired commands, as harmonious as possible [3,4]. In [5], and evaluation of the system for the analysis of human relations based on the use of indistinct theory is proposed.

Analysis of social networks and research on how to appoint experts among several projects to maximize the efficiency of distribution is presented [6]. To calculate the social relations between experts in each project, the authors consider an approach based on genetic algorithm and sociometry

In work [7] the analysis of advantages of the web tool Agent SocialMetric based on the alternation of the analysis of social networks with intelligent dialog agents is given. Researchers Jiamou Liu, Ziheng Wei in their work proposed a game model of cohesion, which is not only based on the social network but also reflects the social needs of people [8]. This model is presented as a type of joint game in which all participants can gain popularity through the strategic formation of groups.

The team of authors in [9], using sociometry, investigates the problem of forming a multiple teams. It is proposed to solve the team optimization model using the following algorithms: constraint programming provided by a commercial solver; local search heuristics and variable meta-heuristics for a variable environment.

Based on an analysis of the social network Twitter, Martin Grandjean identified the structure of relationships and identified users with a special position. His work also shows that language groups are key factors to justify clustering in the network [10].

A new approach to the analysis of social networks is used to measure the social status of students in the study [11]. It is based on a genetic algorithm (GA) and analysis of social networks for grouping partners, for the purpose of joint learning in the classroom.

Also, in the context of our study, interesting is the work [12], where based on the analysis, identified two structures of communication networks for continuous communication and communication twice a day: as a shared network and a coherent network. The main nodes or groups for network architecture in this study are identified through graphical mapping of the network, quantitative analysis of subjective impressions, and quantitative statistical analysis using sociometric techniques.

In the study of I. Khomytska, V. Teslyuk, A. Holovatyy, O. Morushko [13] developed methods and models based on the theory of mathematical statistics and allow to increase the accuracy of differentiation of phonostatistical structures of styles. The program system of text differentiation proposed by the authors and author attribution of the text at the phonological level, where the criterion of text differentiation is the average frequencies of groups of consonant phonemes, in our opinion, can also be effectively used for remote staff selection.

3. Methods of remote selection of personnel based on socionic analysis of the content of social networks

3.1. Method of selection of socionic types

Everyone perceives, processes and transmits information differently. These processes depend on the location of mental functions, their agility and signs of functions (Fig. 1.).

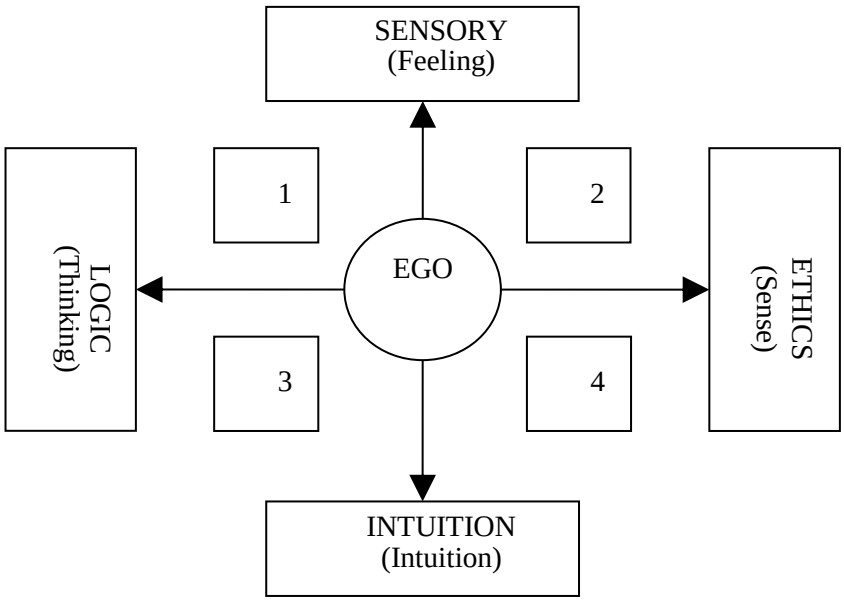

Figure 1: K.-G. Jung. The principle of selection of socionic types

Based on Jung's "coordinate system" [14] and the setting of consciousness (extroverted/introverted), Aushra Augustinavičiūtė singled out 16 socionic types [15], four of which are formed at the intersection of rational (logic/ethics) and irrational (sensory / intuition) coordinates.) functions:

1) LSI - logical-sensory introvert;
   SLE - sensory-logical extrovert;
   LSE - logical-sensory extrovert;

SLI is a sensory-logical introvert.

These four types are formed by a combination of logic and sensory. Common name - practitioners (managers). This is a group of four sociotypes, the most effective in the material and production sphere.

2) SEI - sensory-ethical introvert;
ECE - ethical-sensory extrovert;
SEE - sensory-ethical extrovert;
ESI is an ethical-sensory introvert.

These four types are formed by a combination of ethics and sensory. Common name - social. The group consists of four sociotypes, the most effective in the social sphere (trade, supply, services, leisure, health care, etc.).

3) ILE - intuitive-logical extrovert;
LII - logical-intuitive introvert;
OR - intuitive-logical introvert;
LIE is a logical-intuitive extrovert.

These four types are formed by a combination of logic and intuition. The common name of the group is researchers. This group is the most effective in research.

4) EIE - ethical-intuitive extrovert;
IEI - intuitive and ethical introvert;
EII - ethical-intuitive introvert;
IEE is an intuitive and ethical extrovert.

These four types are formed by a combination of ethics and intuition. The common name of the group is humanities. This group is most effective in the fields of culture, art, religion, psychology and other humanities.

The names of the types are given by the first and second functions of the Ego block and the agility of the first function.

3.2. Visual signs of determining sociotypes

Since we are dealing with 16 basic sociotypes, we must have clear criteria according to which we can identify the subjects belonging to one of them.

In general, there are three main methods of identification - visual, verbal, and testing. Obviously, the best results can be given by the simultaneous application of all three methods. However, in practice, this is not always possible. Therefore, sometimes it is necessary to limit oneself to visual assessment, or visual/verbal definition of sociotype.

In the process of visually / verbally determining the sociotype, we must consistently determine which of the four dichotomous features of Jung is leading, and accordingly determine the sociotype of the subject. Tables 1-4 show the visual signs for identification:

Table 1.
Signs of "rationality-irrationality"

Sign	Rationality	Irrationality
The constitution of the body	Tight and awkward	Streamlined and smooth
Posture	Straight and slender	Omitted
Execution of work	Evenly	Wavy
Movements	Mechanistic and directional	Natural and plastic
Psychological state	Emotionally stable	Emotionally unstable
Tastes and beliefs	Permanent	Volatile
Communicating with others	Mostly verbal	Mostly nonverbal

Table 2.
Signs of "logic-ethics"

Sign	Logic	Ethics
Motives for actions	Objective information	Subjective information
Emotionality	Superficial	Ability to empathize
Evaluation criteria	Good or bad	I like it I don't like it
Decision-making	Sober, objective	Emotional, subjective
Contacts	Mostly formal	Mostly informal
Decision-making	Complete independence	Dependence on thoughts

Table 3.
Signs of "extraversion-introversion"

Sign	extraversion	introversion
Energy and information	Gives more	Accumulates more
Behavior and work style	Active, expensive	Passive, frugal
Psychological orientation	Understands others better	He understands himself better
Relationship behavior	Attempts to dominate	Ability to adapt
Social behavior	Expansion, expansion	Deepening, improvement
Cognitive interests	Large-scale	Local

Table 4.
Signs of "sensory-intuition"

Sign	Sensory	Intuition
Reaction to irritation	Instant	Slowed down
Hand work	Standard operations	One-time operations
Life priorities	Material well-being	Spiritual needs
Criteria for good relations	Creating comfortable conditions	Disclosure of identity
Social behavior	Focus on the past	Focus on the future
Type of intelligence	Specific thinking	Abstract thinking

To identify verbal signs, we can use the technique already described in our work [16, 17].

3.3. Methods of determining psychological compatibility

The comfort/discomfort of the relationship between team members will depend on the type of intertype relationship and the numerical equivalent into which we can translate it - the psychological distance. Therefore, having the results of the definition of socionic types, we can use tables 5 and 6 to obtain the initial data to assess the potential coherence of the team, which includes:

Table 5.
Lashkevicius. Intertype relations

me / him	ILE	SEI	ESE	LII	EIE	LSI	SLE	IEI	SEE	ILI	LIE	ESI	LSE	EII	IEE	SLI
ILE	I	Ad	A	M	O	C	B	Mr	Se	Re	Q	Ct	S	UC	Rl	Sd
SEI	Ad	I	M	A	C	O	Mr	B	Re	Se	Ct	Q	UC	S	Sd	Rl
ESE	A	M	I	Ad	R	Sd	S	UC	Q	C	Se	Re	B	Mr	O	C
LII	M	A	Ad	I	Sd	R	UC	S	Ct	Q	Re	Se	Mr	B	C	O
EIE	S	UC	Re	Sd	Ad	B	A	M	O	C	B	Mr	Se	Re	Q	Ct
LSI	UC	S	Sd	Re	B	I	M	A	C	O	M	B	Re	Se	Ct	Q
SLE	B	Mr	O	C	A	M	I	Ad	Re	Sd	S	UC	Q	Ct	Se	Re
IEI	Mr	B	C	O	M	A	Ad	I	Sd	Re	UC	S	Ct	Q	Re	Se
SEE	Se	Re	Q	Ct	S	UC	Re	Sd	Ad	B	A	M	O	C	B	Mr
ILI	Re	Se	Ct	Q	UC	S	Sd	Re	Ad	I	M	A	C	O	Mr	B
LIE	Q	Ct	Se	Re	B	Mr	O	C	A	M	I	Ad	Re	Sd	S	UC
ESI	Ct	Q	Re	Se	Mr	B	C	O	M	A	Ad	I	Sd	Re	UC	S
LSE	O	C	B	Mr	Se	Re	Q	Ct	S	UC	Re	Sd	I	Ad	A	M
EII	C	O	Mr	B	Re	Se	Ct	Q	UC	S	Sd	Re	Ad	I	M	A
IEE	Re	Sd	S	UC	Q	Ct	Se	Re	B	Mr	O	C	A	M	I	Ad
SLI	Sd	Re	UC	S	Ct	Q	Re	Se	Mr	B	C	O	M	A	Ad	I

Table 5 used the following abbreviations: Ad - addition; I - identity; A - activation; M - mirrors; Q - Quasi-identity; Se - superego; Ct - conflict; Re - repayment; Rl - related; Sd - semi-dual; B - business; O - order (customer); S - subcontracted (subcontracted); C - control (controller); UC - is under control, Mr – mirage.

Tables 5 and 6 use the abbreviated abbreviation of the canonical names of sociotypes: ILE - intuitive-logical extrovert; SEI - sensory-ethical introvert; ECE - ethical-sensory extrovert; LII - logical-intuitive introvert; EIE - ethical-intuitive extrovert; LSI - logical-sensory introvert; SLE - sensory-logical extrovert; IEI - intuitive and ethical introvert; SEE - sensory-ethical extrovert; OR - intuitive-logical introvert; LIE - logical-intuitive extrovert; ESI - ethical-sensory introvert; LSE - logical-sensory extrovert; EII - ethical-intuitive introvert; IEE - intuitive and ethical extrovert; SLI is a sensory-logical introvert.

Let the plural $X = \{x_1, x_2, x_3, ..., x_n, \}$ – some team consisting of *n* members, and x_i, $i = \overline{1,n}$ – some individual of this team. According to the table 5, there is a complete binary relation ρ , which determines the intertype relationship between a pair of individuals in the team X. Weight matrix of the ratio ρ will be a matrix, defined in table 6 with elements $m_{i,j}$ – absolute values of intertype distances between individuals of the team *X*.

Let's mark k_i – the coefficient of conflict of the i-th individual of the team X relative to all its other members, which will be calculated by the following formula: $k_i = \frac{\sum_{j=1,\ j\neq i}^{n} m_{i,j}}{n-1}$, for all values $i = \overline{1,n}$.

Let's mark $F(X)$ – team conflict function X, the value of which will be the sum of the values of the coefficients of conflict of all team members and calculated by the formula $F(X) = \sum_{j=1}^{n} k_j$.

Table 6.

Intertype relations. Psychological distance (author's)

me / him	IL E	SE I	ES E	LI I	EI E	LS I	SL E	IE I	SE E	IL I	LI E	ES I	LS E	EI I	IE E	SL I
ILE	1	1	1	1	2	2	2	2	4	4	4	4	3	3	3	3
SEI	1	1	1	1	2	2	2	2	4	4	4	4	3	3	3	3
ESE	1	1	1	1	3	3	3	3	4	4	4	4	2	2	2	2
LII	1	1	1	1	3	3	3	3	4	4	4	4	2	2	2	2
EIE	3	3	3	3	1	1	1	1	2	2	2	2	4	4	4	4
LSI	3	3	3	3	1	1	1	1	2	2	2	2	4	4	4	4
SLE	2	2	2	2	1	1	1	1	3	3	3	3	4	4	4	4
IEI	2	2	2	2	1	1	1	1	3	3	3	3	4	4	4	4
SEE	4	4	4	4	3	3	3	3	1	1	1	1	2	2	2	2
ILI	4	4	4	4	3	3	3	3	1	1	1	1	2	2	2	2
LIE	4	4	4	4	2	2	2	2	1	1	1	1	3	3	3	3
ESI	4	4	4	4	2	2	2	2	1	1	1	1	3	3	3	3
LSE	2	2	2	2	4	4	4	4	3	3	3	3	1	1	1	1
EII	2	2	2	2	4	4	4	4	3	3	3	3	1	1	1	1
IEE	3	3	3	3	4	4	4	4	2	2	2	2	1	1	1	1
SLI	3	3	3	3	4	4	4	4	2	2	2	2	1	1	1	1

Through the use of this technique, we can determine both the integral coefficient of conflict and the personal coefficient of conflict of each member of the team. This allows us to choose the optimal team leader. This is how we will consider a team member with the minimum value of the coefficient of conflict. In addition, we have the opportunity to assess the comfort of each member of the team in this team. The higher the coefficient of conflict, the less comfortable a person will feel in this team [18].

Regarding the purposeful selection of staff for vacant positions, in our opinion, it would be appropriate to use the method of creating a socionic portrait of the ideal candidate. To do this, based on the application of Jung's basis, we consistently determine which of the four pairs of dichotomous features will be more optimal. For example, we are looking for a person to be a salesperson. This profession requires a high degree of contact with clients, the ability to empathize, the ability to persuade here and now, constant efficiency, and stay in shape. So, it must be ethical, extrovert, sensory, rational. An ethical-sensory extrovert meets these criteria.

For the formed team, we can also define such a value as an integral sociotype. Knowledge of the integrated sociotype of the team allows us to predict what kind of tasks the team can better cope with [19].

To search for potential candidates to fill a vacancy, we can use information from open sources - Internet sites for job search / job offers, or information that is posted on social networks by job seekers. The main criterion for us will be the presence of several fairly clear photos (profile / full face), which can be analyzed according to Jung's basis, as well as the presence of text messages (summaries) - for verbal analysis by the above method [20].

3.4. Examples of application of socionic analysis

We will consider how this technique can work on concrete examples. Photos and text data for analysis are taken from the social networks Linkedin and Facebook.

Example 1.
User Daria Norikova.

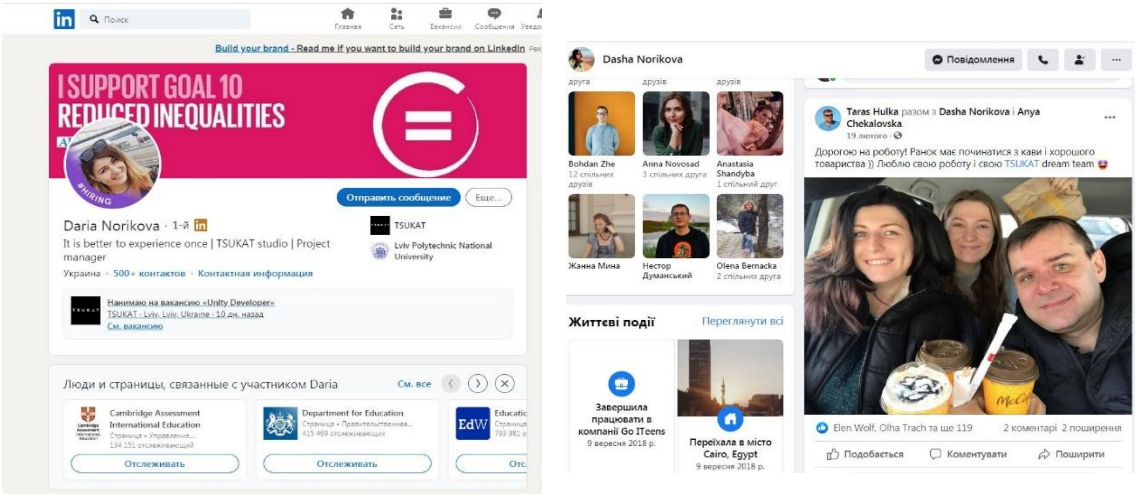

Figure 1: Photos by Daria Norikova on Linkedin and Facebook.

From the above photos, we can conclude that the user is a logician because the upper part of the face is not round, but rectangular. Also with a high probability can be said about extraversion - dynamic poses and the desire to be the center of attention. The shape of the face is pentagonal, which indicates intuition. And finally - the shoulders are straight, the figure is tightened, that is, it is rational. Thus, based on the diagnosis, we can conclude that Daria corresponds to the sociotype of a logical-intuitive extrovert (LIE) - "Jack London".

Now we will conduct a verbal analysis of Daria Norikova's text messages.

A detailed analysis of the text message shows us first of all extraversion (very dynamic presentation of information) and intuition - sensors most likely will not risk going on vacation in the mountains without their own equipment. The ability not to get confused and use the situation to your advantage indicates the presence of business logic. It follows that the program function is business logic, and creative - the intuition of possibilities. So, before us is a logical-intuitive extrovert.

In this candidate, the upper part of the face is rectangular, which indicates logic. The shape of the face itself is elongated, teardrop-shaped. This is typical of intuitions. The photo shows that the body shape is streamlined, the shoulders are lowered. So, before us is irrational. Also in the photo we see static poses, so most likely we have an introvert. Therefore, our previous hypothesis of Pavel Khud's sociotype is an intuitive-logical introvert (OR) - "Balzac".

Now let's do a verbal analysis.

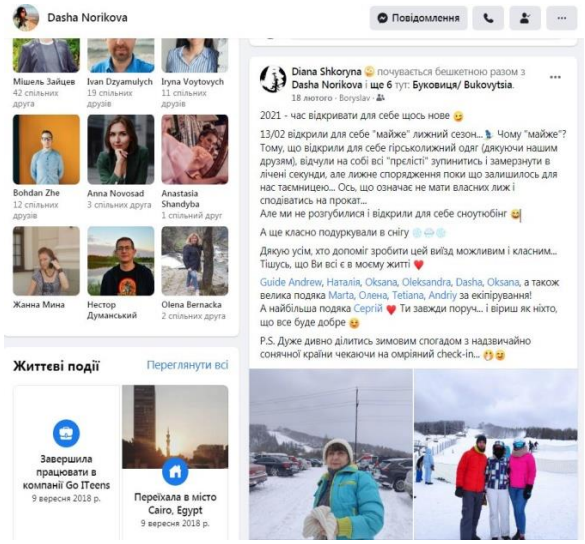

Figure 2: Daria Norikova's Facebook post.

From the above in Fig. 4. A fragment of a text message can draw the following conclusions. At the beginning, the word "assume" is used twice. The use of such words is inherent in intuitions. The emphasis on the timeliness of certain actions gives us clarification - it is the intuition of time. The text is quite pragmatic.

In addition, we did not ignore the text message from the second photo (Fig. 5). Such statements are inherent in business logic. Actually, we can say that there is a fact of manipulation of business logic (value in deeds, not words). Therefore, business logic in this case is a manipulative (creative) function, and software is the intuition of possibilities. There is a high probability that we have an intuitive-logical introvert.

Example 2.
User Pavlo Khud.

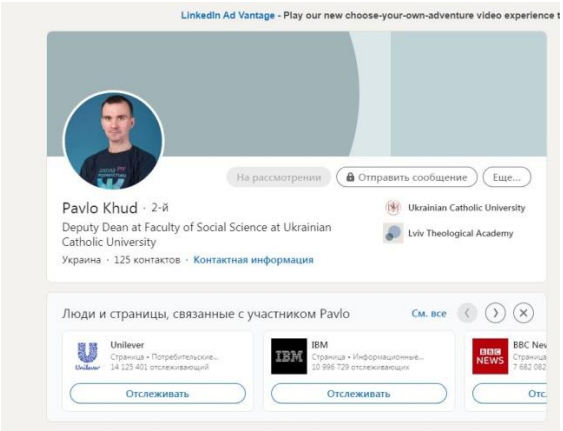

Figure. 3: Photos by Pavel Khud on Linkedin and Facebook.

If Daria and Pavlo had to work in the same team, their intertype relationship is a mirror image. Both belong to the representatives of the third quadrant. The psychological distance is minimal - the first. This is a very favorable, comfortable relationship, provided that there are no elements of direct competition. Therefore, it would be better for both of them to have the working group they belong to headed by a third person, preferably an ethicist from the third quadrant.

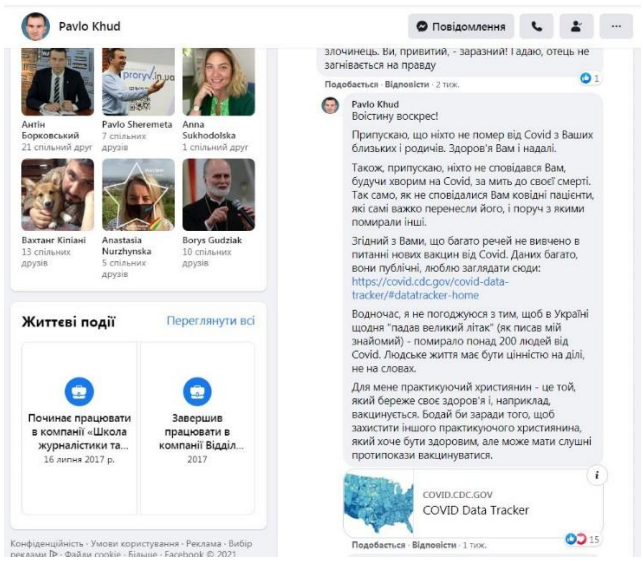

Figure 4: Post by Pavel Khud on Facebook.

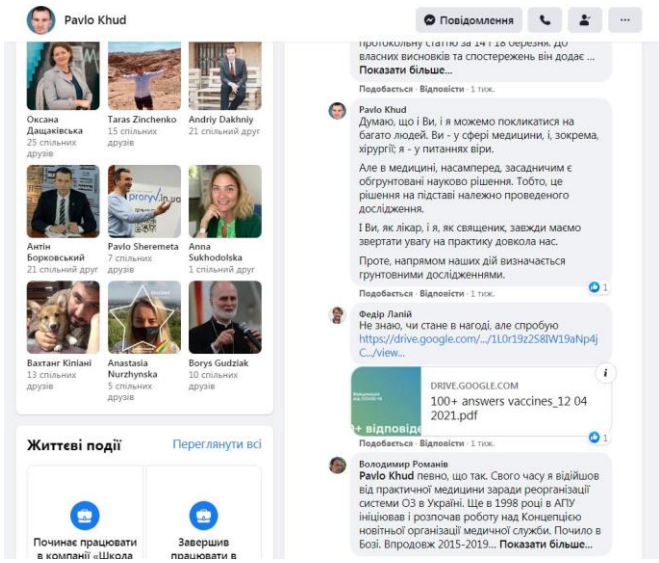

Figure 5: Post by Pavel Khud on Facebook

4. The analysis of the obtained results

The outcome obtained as a result of socionic analysis can be presented in the form of a table 7:

Table 7.
The results of the socionic analysis

The dichotomous function	Example 1	Example 2
Extraversion / introversion	Extraversion	Introversion
Logic / ethics	Logic	Logic
Sensory / intuition	Intuition	Intuition
Rationality / irrationality	Rationality	Irrationality
Defined sociotype:	**Logical-intuitive extrovert (LIE)**	**Intuitive-logical introvert (OR)**

Substitute the results obtained in tables 5 and 6. According to them, these intertype relationships are mirror images. Both belong to the representatives of the third quadrant. The psychological distance is minimal - the first. Both belong to the socionic club of researchers. This is a very favorable, comfortable relationship, provided that there are no elements of direct competition. Communication is pleasant, easy and almost conflict-free. Quite good interaction and understanding. Both sociotypes have strong (working) and weak (problem functions), for which they are not able to provide each other with effective assistance. Therefore, it would be better for both of them to have the working group they belong to headed by a third person, preferably an ethicist from the third quadrant. This harmonizes these relationships, makes them constructive [16, P. 157].

5. Conclusions

Modern trends in the development of the information society suggest that the relationship between real and virtual communication will steadily increase in favor of the latter. In turn, this will necessitate the search for technologies and techniques that will compensate for the loss of some of the information that was obtained during direct communication, through accessible content from social networks (photos and text messages).

Applying the method of socionic analysis in gathering the necessary information can provide a number of competitive advantages. By knowing the information language in which our communication partners communicate, it is possible to build a communicative model of communication in which it will be easier to reach a consensus [21].

Knowledge of practical psychology in our time is becoming an important communication tool. They allow you to effectively use human resources, build successful teams, much more effectively resolve industrial conflicts.

An important step in this direction is proper personal self-identification. It allows you to develop individual tools for determining the sociotypes of other people, optimized for your own sociotype. The method of determination cannot be absolutely the same, as each of the basic 16 sociotypes has its own characteristics.

Knowledge of one's own sociotype and the sociotype of one's interlocutor makes it possible to determine the type of intertype relations and the optimal psychological distance. This information also allows you to choose the most appropriate information channel (channels) for communication, and also allows you to consciously avoid communication on controversial topics.

The successful implementation of projects directly depends on skillfully selected staff, clearly defined tasks that will face them, minimizing misunderstandings and conflicts that arise in the process of working together. The biggest responsibility for this lies with line managers, although much will also depend on how well-coordinated the team was. Proper and appropriate use of socionic analysis methods can minimize the risks of remote recruitment. The scientific novelty of the method of socionic analysis proposed by the authors lies in the relative simplicity and accessibility of the method. It does not require significant financial costs. A qualified specialist can teach any manager in a relatively short period of time the basic elements of applying this method.

It is enough to correctly analyze the visual and verbal information available from social networks.

6. References

[1] Ion Georgiou, Ronald Concer, Andrej Mrvar, A systemic approach to sociometric group research: Advancing the work of Leslie Day Zeleny, 1939-1947, Social Networks, Volume 63 (2020) 174-200. doi.org/10.1016/j.socnet.2020.01.002

[2] M. Campêlo, T. Figueiredo, & A. Silva, The sociotechnical teams formation problem: a mathematical optimization approach. Ann Oper Res 286, (2020) 201–216. https://doi.org/10.1007/s10479-018-2759-5.

[3] A. Batyuk, V. Voityshyn, Apache storm based on topology for real-time processing of streaming data from social networks in Proceedings of the 2016 IEEE 1st International Conference on Data Stream Mining and Processing, DSMP 2016, 2016, стр. 345–349.

[4] O. Mulesa, F. Geche, A. Batyuk, Information technology for determining structure of social group based on fuzzy c-means, in Proceedings of the IEEE Xth International Scientific and Technical Conference on Computer Sciences and Information Technologies, CSIT 2015, Lviv, 2015, pp. 60-62. doi: 10.1109/STC-CSIT.2015.7325431
[5] T. Yoshizumi, T. Sumida, Y. Shiono, M. Namekawa, K. Tsuchida, (2020) Evaluation of Advanced Analysis Method for Human Relationship Using Fuzzy Theory. In: Abraham A., Cherukuri A., Melin P., Gandhi N. (eds) Intelligent Systems Design and Applications. ISDA 2018. Advances in Intelligent Systems and Computing, vol 940. Springer, Cham. https://doi.org/10.1007/978-3-030-16657-1_72.
[6] V. S. Baghel and S. D. Bhavani, Multiple Team Formation Using an Evolutionary Approach, 2018 Eleventh International Conference on Contemporary Computing (IC3), 2018, pp. 1-6, doi: 10.1109/IC3.2018.8530662.
[7] A. Kuz, Agent SocialMetric: a web-based platform for teaching environments and conflict assessment support in the classroom. Complutense Journal of Education, 28 (3), (2017) 941-958. doi.org/10.5209/rev_RCED.2017.v28.n3.51366.
[8] J. Liu, Z. Wei, Network, popularity and social cohesion: A game-theoretic approach, CoRR, 2016. URL:https://arxiv.org/abs/1612.08351.
[9] Jimmy H. Gutiérrez, César A. Astudillo, Pablo Ballesteros-Pérez, Daniel Mora-Melià, Candia-Vejar, Alfredo. The multiple team formation problem using sociometry, Computer & Operations Research, Vol. 75, 2016, pp.150-162. doi.org/10.1016/j.cor.2016.05.012.
[10] Martin Grandjean, Aaron Mauro (Reviewing Editor), A social network analysis of Twitter: Mapping the digital humanities community, Cogent Arts & Humanities, Volume 3, Issue 13, 2016, doi.org/10.1080/23311983.2016.1171458.
[11] Rong-Chang Chen, Shih-Ying Chen, Jyun-You Fan, Yen-Ting Chen, Grouping partners for cooperative learning using genetic algorithm and social network analysis, Procedia Engineering, Volume 29, 2012, pp. 3888-3893. doi.org/10.1016/j.proeng.2012.01.589.
[12] Harry L. Litaker, Robert L. Howard, Social network analysis and dual rover communications, Acta Astronautica, Volume 90, Issue 2, 2013, pp. 367-377. doi.org/10.1016/j.actaastro.2012.05.013.
[13] I. Khomytska, V. Teslyuk, A. Holovatyy, O. Morushko, Methods, models and means of the system for differentiation of phonostatistical structures of engglish functional styles. Development of methods, models and means of authorship attribution of a text. In: Eastern-European Journal of Enterprise Technologies. № 3/12 (93), 2018, pp. 41–46.
[14] C.G. Jung, Psychological Types. In: Princeton University Press, 1976.
[15] A. Augustinavichyute, Socionics. Introduction. In: Terra Fantastica, 1998.
[16] O. O. Morushko, N.O. Khymytsia, Humanization of information exchange, Triada Plus, Lviv, 2017.
[17] A. Morushko, N. Khymytsia, N. Shakhovska, Determining the Psychological Portrait of Members of Web Communities through Socionic Analysis, Proceedings of the 2nd International Workshop on Control, Optimisation and Analytical Processing of Social Networks (COAPSN 2020), Lviv, Ukraine, 2020, pp. 112-124.
[18] K. Pietrak, The foundations of socionics – A review, Cognitive Systems Research 47, (2018), pp. 1-11.
[19] M. Vaida, Collaborative Education Teams Development Using Alternative Methodologies, ICETC 2019: Proceedings of the 2019 11th International Conference on Education Technology and Computers, Amsterdam Netherlands, October 28 - 31, (2019), pp. 223–227.
[20] D. Zakharov, Recruitment Using Social Networks, Control, 6(1), (2018), pp. 25-30.
[21] V. Kraev, A. Tikhonov, Modern recruitment approaches in personnel selection, Revista, Espacios, Vol. 41 (Issue 12), (2020), p. 12.