The Intelligent System Development for Psychological Analysis of the Person's Condition

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Abstract

A system for the individual psychological and emotional state analysis is developed. The aim is to assess the individual through practical and recommendations social networks. The assessment data, this area problems and the system's relevance analysis are studied. The diagrams are developed that describe the system logic and structure. System requirements and a prototype application description are done According to RUP methodology, which stimulates an individual analysis system activity is created.

Keywords 1

Social network, information system, intelligent system, information technology, psychological analysis, personality trait, emotional state, big data, psychological state, system analysis, information resource, text analysis, data processing, social network personal analysis, Facebook profile, psychological type, modern machine learning technology, psychological portrait, decision making

1. Introduction

Life poses professional and personal problems to the person constantly. It is not enough to have the skills, the mind, the gift, and the honesty to succeed. Success also depends on a person's self-esteem, attractiveness, competence, competitiveness, communication skills, ability to be a team player. In market relations, for a modern specialist, a psychological culture, the main components of knowledge of oneself, another person, a culture of behaviour and communication, is no less important than, for example, knowledge of a personal computer or knowledge of a person a foreign language. The success of affairs depends on the psychological culture of human. It is relevant in today's world in the age of social networking, where accounts have become an inexhaustible source of information about each individual. Posts on Twitter, Vkontakte, and Facebook posts, even subscriptions to certain bands and music, are valuable information that allows you to find out a nearly complete psychological portrait of a person before getting to know her. Social network users often behave differently than in real life, which is one of the problems in determining psychological and emotional state.

On the other hand, given this fact, you can understand how a person sees himself in the outside world and what points of interaction with him can found. Therefore, it becomes urgent to learn how to behave

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in a social network to feel as if they are a socially successful person. It is necessary to learn how to use social networks properly and learn to filter public content because the ability to present this information psychologically correctly largely depends on the success of each person. There are few information resources and programs available to help determine a person's psychological or emotional state through social networks. Mostly, it comes down to apps or programs that offer some tests to determine your character, "compatibility" with your friends, and more. However, they all have one major flaw - they are not automated. Everyone is required to undergo tests each time, and often the results of these tests are different. A person strives to minimise their efforts to obtain the information they seek. It is more convenient for the user, by installing the application or by registering on the information resource, to be constantly acquainted with assessing their psychological or emotional state. Therefore, the construction of information systems that will perform this work is relevant.

The purpose of the work is to create a system for analysing the personal user data (messages on social networks, tweets, etc.) and building a psychological portrait of a person with the generation of conclusions and recommendations of the psychological and emotional state of the individual.

2. Related works

Social networks are becoming more and more popular. A considerable number of people have accounts in several of them at once. With the help of social networks, people find their friends, socialise, share interests, share information. At the same time, actively using social networks, a person informs himself of various content. Is it possible to say anything specific about the person based on this information or to use it, for example, for job evaluation? The idea of evaluating a person's personality by their activity in social networks is increasingly capturing the minds of researchers. Several such attempts have recently made. Donald Kluemper and his companions published an article [1] in 2012describing how three specially trained evaluators more or less successfully identified the personal traits of Facebook users on their profile. The researchers set out to test whether the owner of the Big Five characteristics could be determined based on an analysis of a Facebook profile, predict the likelihood of hiring that person for work, and their future effectiveness, although the predictive validation of expert estimates was low and the sample was small. Many unique features are reflected in the Facebook profile, according to the authors. For example, the number of friends may be associated with extraversion, people with a high level of awareness are more likely to be more cautious about the content of messages and comments they write online, and people with expressed kindness will be more trusting, so their profile will contain more information that is personal. To test these assumptions, three specially trained evaluators, each of whom completed two-hour training, were asked to analyse 274 profiles of real people on the Facebook network. In addition, assess based on this information is the holders of these profiles of each Big Five features (neuroticism, extraversion, openness to experience, goodwill, awareness) and determine the likelihood of hiring them for a starting position in the service industry. Six months after the evaluation procedure, the researchers attempted to contact the leaders of the evaluated study participants. They asked them to fill in questionnaires about the effectiveness of the employee and his or her "civic" behaviour toward colleagues and the organisation as a whole. Such data is collected from 56 executives.

The results showed that the estimates of personality traits obtained from the experts are significantly related ($r = 0.23$-0.44) to the estimates obtained by the personal questionnaire. Thus, analysing a Facebook profile is a good way to evaluate the personality traits of its owner. A significant correlation is also found between the personality traits of a Facebook profile and the performance estimates received from executives. The most predictable power is emotional stability ($r = 0.27$) and goodwill ($r = 0.31$). Among the estimates of personality traits obtained from the most evaluated, the only extraversion correlates with work efficiency ($r = 0.28$). Thus, Facebook profile analysis has proven to be a more valid predicting performance than personal questionnaires. Considering that it took an average of 5 to 10 minutes to analyse one profile of assessors, this method of personality assessment is desirable to use in the selection process. However, its use involves some legal and ethical issues. For example, during an interview, the employer may not ask questions regarding race or religion, sexual orientation, marital status, etc. When analysing the same profile on the social network, this information

can become obvious and affect the hiring decision. However, researchers at the University of Pennsylvania (https://www.upenn.edu/) and The Psychometrics Centre - University of Cambridge (https://www.psychometrics.cam.ac.uk/) have done. In September 2013, they published an article [2] describing the results of the analysis of 700 million words, phrases and topics collected from Facebook posts by 75,000 people. The analysis showed striking differences in the frequency of different words and phrases between people of different sex, age, and personality traits. Here, for example, the differences between men and women are shown in Figs. 1a, the differences between age groups (13–18, 19–22, 23–29, 30–65) are shown in Fig 1b. However, the differences between extroverts and introverts, between neurotics and emotionally stable are shown in Figs. 2. This research is part of the World Well-Being Project, in which several studies based on social network analysis have made and are being carried out.

a) b)

Figure 1: a) The differences between men and women and b) age differences [2]

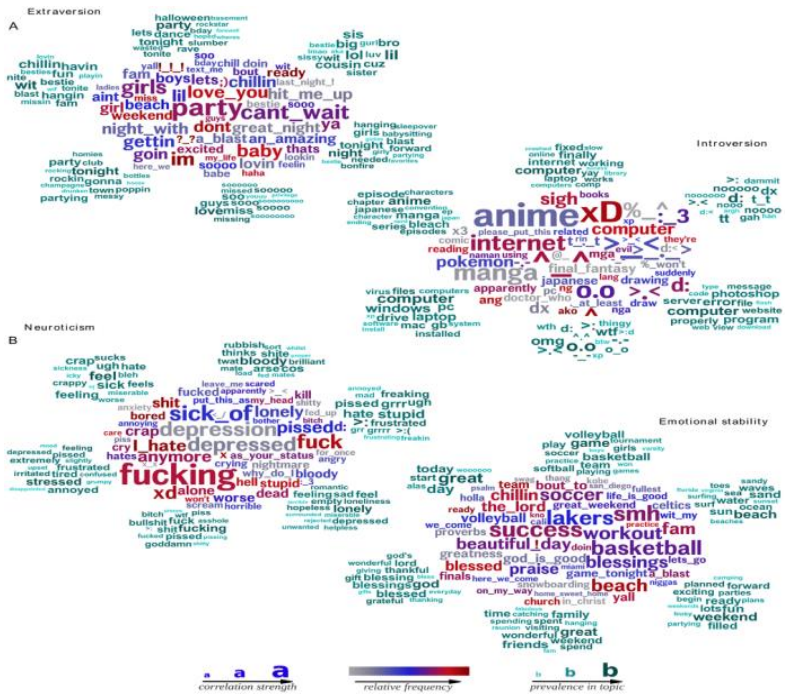


Figure 2: Differences between different emotional types [2]

The Psychometrics Centre - University of Cambridge (https://www.psychometrics.cam.ac.uk/) is also trying to predict the individual characteristics of a person by liking it on Facebook. An analysis of such preferences of 58,000 people showed [3] that their model assumes belonging to:

- White Americans or African-Americans in 95% of cases,
- Gender - in 93% of cases,
- Sexual orientation - in 88% of cases in men and 75% of subjects in women,
- Democrats or Republicans in 85% of cases,
- Christians or Muslims in 82% of cases.

The accuracy of the prediction of the remaining dichotomous variables shows in Fig. 3a.

In terms of personality traits, the predictive validity is lower: intelligence (r = 0.39), extraversion (r = 0.40), openness (r = 0.43). However, it is quite comparable to the validity of personality tests. The accuracy of the prediction of other individual features shows in Fig. 3b. These results suggest that many tasks for assessing certain specific characteristics of a person (including personality traits) can analyse their profile and activity on social networks. In doing so, it will not be a person but a computer. In recruitment, for example, every second person searches for a candidate's social networking profile before inviting him for an interview. Of course, there are difficulties and limitations. First, as soon as the majority learns that and with what accuracy their social media profiles can be determined, the majority will either cease using them actively, or create several accounts, or, using social networks, use a specific strategy by creating a certain image of yourself (such is the socially desirable use of Facebook). There are also ethical issues. However, the prospects are astounding.

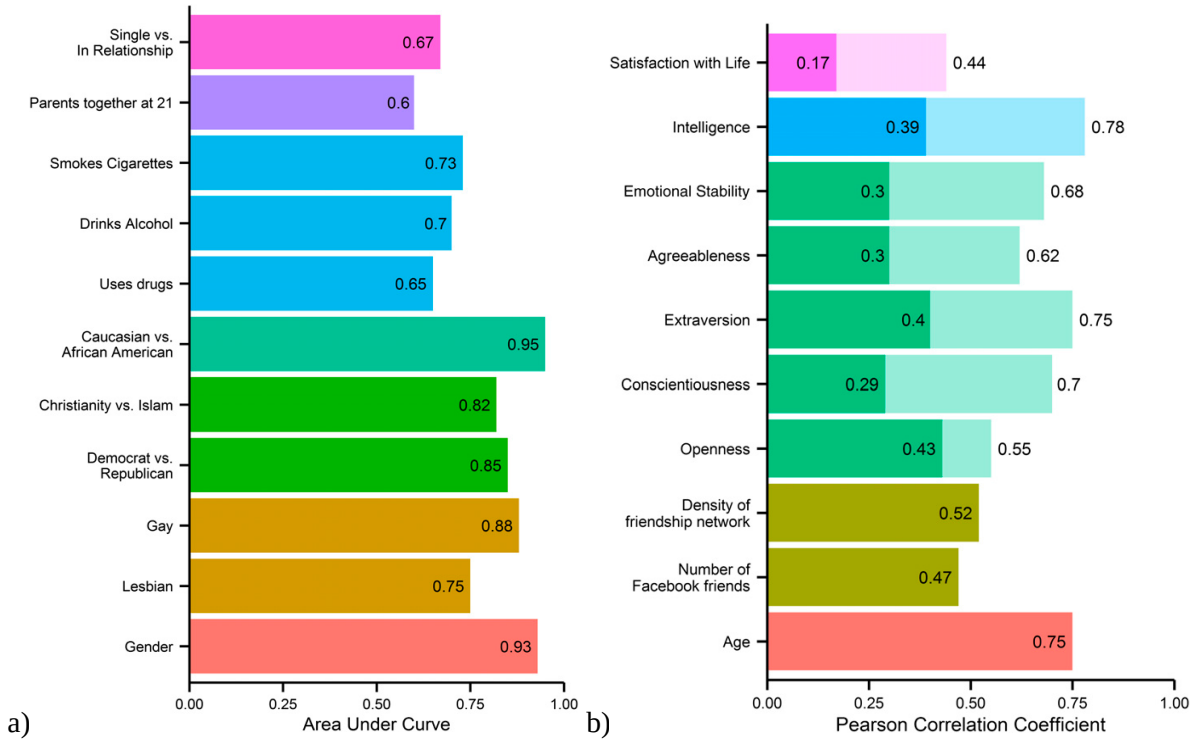


Figure 3: Prediction of a) individual specifics and b) other characteristics of the user's Facebook [3]

Analysis of known remedies. Psychological research is very relevant in the modern world, especially in developing information technologies and social networks. However, there are currently no software or information systems on the software market that would address this comprehensively and thoroughly. All existing applications can \ divided into the following subgroups:

1. WEB applications and online tests. This software functions as a standard test: you are asked to take a test and answer specific questions. Based on these answers, the program finds a match in its database or, using different algorithms, determines the percentage composition of the answers, and selects the most competitive one. The problem with such programs is that they are not complete information systems [4-15]. Often, this is generally a separate web page with a set of scripts. Such programs cannot learn and analyse vast amounts of information [16-20].

2. Statistical systems. This software can handle large data sets and generate statistics. For example, you could show a sample of the most common words and phrases [16-20]. The person carries out further analysis of the data and, on its basis, makes the appropriate conclusions. There is no complete computer analysis and system training [21-33].

The following resources can be exemplified as appropriate systems:

- Istio.com - allows you to get advanced text analysis by word, output the top most used words and other text information.

Analysis result	
Parameter	Value
Length without spaces	1503 symbols
Total words	221
Water	27%
Nausea	2.64
Top 10 words	Given, should, information , systems, system, function, base, mean, butt, she
Vocabulary	145 words
Core vocabulary	115 words
Language	Eng.

Words statistics, excluding stop words					
#	Word	Amount ?	Rel. ?	% in core ?	% in the text ?
1	Data	7	2.64	4.4%	3.1%
2	should	6	2.26	3.7%	2.7%
3	information	5	1.88	3.1%	2.2%
4	systems	4	1.51	2.5%	1.8%
5	system	4	1.51	2.5%	1.8%
6	function	4	1.51	2.5%	1.8%
7	base	3	1.13	1.8%	1.3%
8	mean	3	1.13	1.8%	1.3%
9	butt	3	1.13	1.8%	1.3%

Figure 4: The results of the text's analysis on Istio.com

- Info.seocafe.info - resource allows you to define the basic parameters of the text that designed mainly for SEO optimisation (Fig. 5).

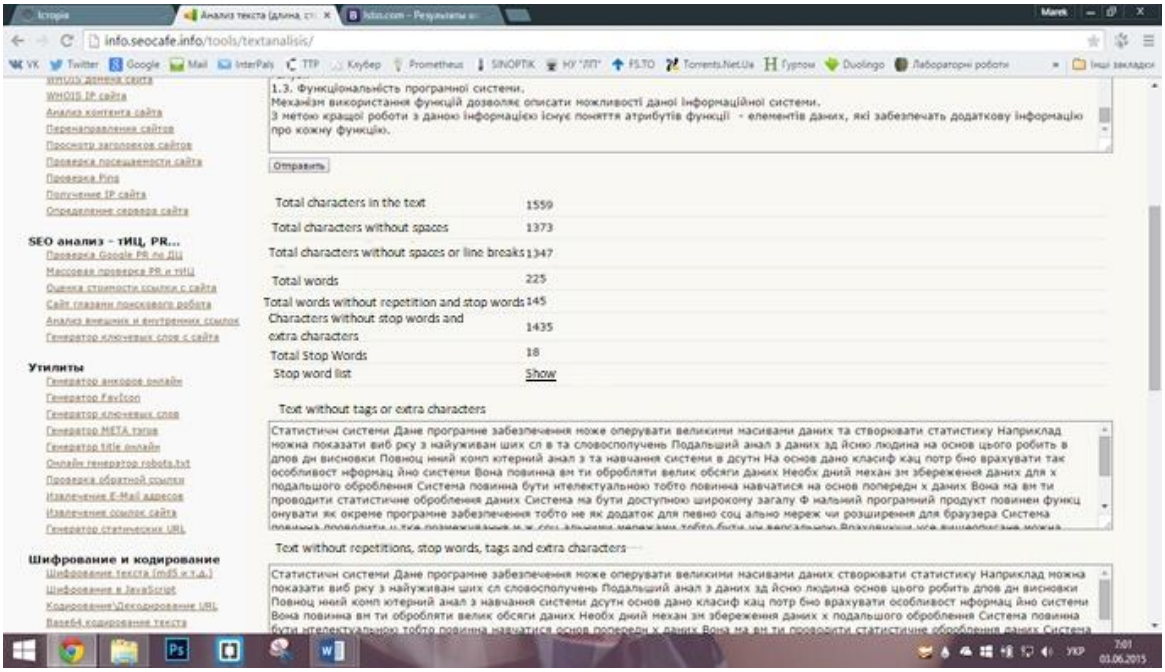


Figure 5: The results of the text's analysis on Info.seocafe.info.

The advantages of such resources are ease of use - the user simply enters the required text, and the system automatically processes it [34-39]. However, the disadvantage is that these systems do not allow

you to determine a person's psychological or emotional state because they are intended for statistical processing of the text [40-43].

Based on this classification, the following features of the system should be considered:

1. The system must process large amounts of data [44-48].
2. There is a need for a mechanism to store the data for further processing [49-50].
3. The system must be intelligent (i.e. it must be trained based on previous data) [52].
4. The system must be able to perform statistical data processing [53].
5. The system should be accessible to the public [54].
6. The final software should function as standalone software (not an application for a particular social network or browser extension) [55].
7. The system must draw a clear distinction between social networks (that is, be universal) [1-20].

Given all of the above, it is possible to note the relevance of the work. It will be helpful to ordinary users as well as to employers or other public services.

3. Material and methods

The software system functionality. The mechanism of use of functions allows describing the possibilities of this information system (Table 1, Fig. 6). To improve the work with this information, we introduce the concept of function attributes - data elements (Table 2), which will provide additional information about each function (Table 3).

Table 1
System functions

No	Name	Description(function value)
1	Personalisation	Each program must strictly personalised to the specific person that is each user should create an account to simplify the functioning of the information system
2	Protecting personalised information	When creating an account, the user will provide sensitive information protected from unauthorised use by third parties.
3	Primary data analysis	Collecting and processing data from a profile on a social network. Key metric filtering
4	Statistical data processing	Identifying critical patterns in the collected data and compiling a statistical report
5	Training	Based on the collected data and previous experience - the refinement of the program's previous findings or creation of new ones
6	Storing the data that has been processes	Providing access to pre-analysis data for the user
7	Character analysis	Identifying critical indicators of a person's character
8	Analysis of temperament	Identification of critical indicators of a person's temperament
9	Analysis of emotionality	Identification of critical indicators of a person's emotionality
10	Analysis of self-esteem	Identifying critical indicators of a person's self-esteem
11	Analysis of volitional qualities	Determination of critical indicators of a person's volitional qualities
12	Analysis of social qualities	Identifying critical indicators of a person's social qualities
13	Comparison and adjusting the results	Based on features 7-12, compare previous results with current results and adjust them if necessary

14	Formulation of general conclusions	The generalisation of the psychological state of the individual
15	Making recommendations	Identifying the necessary strategies for communicating with the individual or other interaction features
16	Reporting a study error	Identifying a study error and keeping it informed
17	Help on using the program	Creating complete support for the user
18	Correcting possible analysis errors	The ability for certain users with the necessary authority to correct possible errors in the mechanisms of psychological analysis or the results
19	Determination of psychological type by S. Freud	Typing of personality by Sigmund Freud's research and classification
20	Jung's definition of psychological type	Typing of personality by research and classification of Jung
21	Encyclopaedia and information on psychology	Creation of the necessary reference book, which contains a description of all the psychological characteristics of the individual
22	Data backup	Data backup function for cases where this data can be lost (personal data, research data)
23	The function of accessing data and comparing data from different social networks	The ability to interactively compare data from different social networks
24	Personal Analysis	The ability to personally analyse a personalised user, both based on their social media accounts and queries
25	Finding people by specific types or preferences	Based on specific preferences, search or filter people on social networks

Table 2
Attributes of functions

No	Attribute	Description (Function Value)
1	Status (determination of the final version of the feature approval)	Suggested. Approved. On.
2	Priority (importance of function)	Critical. Important. Useful
3	Difficulty (complexity of function implementation)	Low. Average. High.
4	Risk (the likelihood that implementing a function will cause undesirable effects such as cost increases, changes in the implementation schedule, etc.)	Low. Average. High.
5	Stability (the likelihood that this function will change over time)	Low. Average. High.
6	Target version (the version of the product where the feature first appears)	Version number
7	Purpose (comments for developers that improve their understanding of development)	Comment

Based on the analysis of known means of solving the problem and taking into account the features of IP, it is possible to distinguish the finite functions (Table 3).

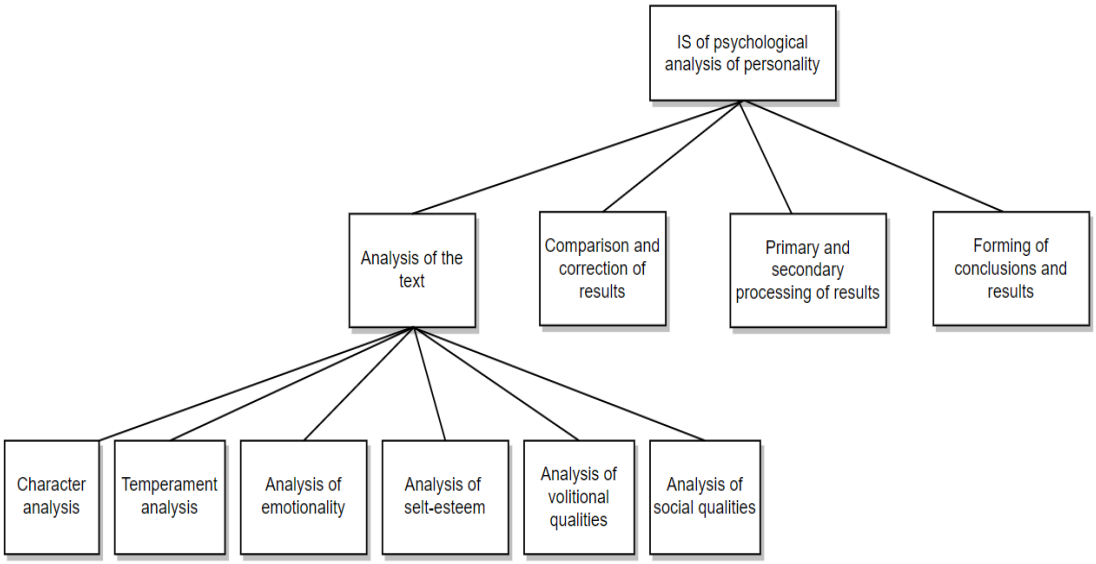


Figure 6: Node tree

Table 3
System functions

N	Priority	Status	Purpose	Stability	Risk	Employment	Version
1	Critical	Included	data personalisation	High	Low	Average	1.0
2	Critical	Included	protection of personal data	High	Low	Average	1.0
3	Important	Included	filtration of data	High	Average	Average	1.0
4	Important	Included	identifying key patterns	High	Average	Average	1.0
5	Important	Included	intellectual learning of the information system	Average	High	High	2.0
6	Important	Included	access to previous program results	Average	Average	Average	3.0
7	Critical	Included	definition of personality	Average	High	High	1.0
8	Critical	Included	determination of personality temperament	Average	High	High	1.0
9	Critical	Included	definition of emotional personality	Average	High	High	1.0
10	Critical	Included	definition of self-esteem of the individual	Average	High	High	1.0
11	Critical	Included	determination of volitional qualities of personality	Average	High	High	1.0
12	Critical	Included	definition of social qualities of personality	Average	High	High	1.0
13	Critical	Included	comparison and correction of results	Average	High	High	1.0
14	Critical	Included	general conclusions	Average	High	High	1.0

15	Critical	Included	recommendations	Average	High	High	1.0
16	Useful	Included	determination of errors in the study	Average	Low	Low	3.0
17	Important	Included	creation of help	Low	Low	Low	2.0
18	Critical	Included	bug fixes	Average	High	High	3.0
19	Important	Proposed	classification by S. Freud	Average	High	High	4.0
20	Important	Proposed	Jung classification	Average	High	High	4.0
21	Important	Proposed	encyclopaedia	Average	Average	Average	4.0
22	Critical	Proposed	data backup	Average	Average	High	4.0
23	Useful	Proposed	personal analysis	Average	Average	High	5.0
24	Important	Proposed	interactive data comparison from different social networks	Average	Average	High	5.0
25	Useful	Proposed	search and filter people by a specific psychological type	Average	High	High	6.0 or more

Considering all of the above, it should be noted that, as there are currently no qualitative and comprehensive solutions on the information technology market that offer a solution to this problem, it is incredibly relevant. The purpose of research in this area is to assess the psychological state of modern society. It is possible to create severe information systems (IPs) that, based on social networks, will determine and predict the so-called "temperature" - the general state of society at a certain point in time. It will help avoid all kinds of problems related to social dissatisfaction of the population, etc., to find your application to solve a wide range of issues and tasks in various fields.

4. Experiments, results and discussion

4.1. System analysis

Fig. 7 shows a diagram of the use case diagram. The use case diagram uses two types of basic entities: use cases and actors, between which the following types of relationships are established: association - between the actor and the use case; generalisations between actors; abstraction between use cases; inclusion between use cases. System requirements description according to RUP methodology:

1. Interested persons of the precedent and their requirements:
    a. Project Administration: wants complete information on IP functioning.
    b. A person whose psychological analysis is being conducted: does not mind that their data will be analysed (i.e., it gives open access to their account);
    c. Registered user: wants to quickly learn the psychological state of a person without spending a lot of time;
2. The IP user, that is, the main actor in this precedent. This ordinary person is a registered user and performs psychological analysis of different persons through IP.
3. Preconditions:
    a. The data of the person whose psychological analysis will investigate should be open.
    b. The user must complete the IP authorisation (or registration) procedure;
    c. IP must be active;
4. The main successful scenario (Fig. 8):
    a. IP searches for a person and retrieves information from their account;
    b. The user enters the name or ID of the person whose social network account is being investigated;

c. IP conducts data analysis;
d. The user begins a new psychological study;
e. IP displays detailed analysis results on the screen.

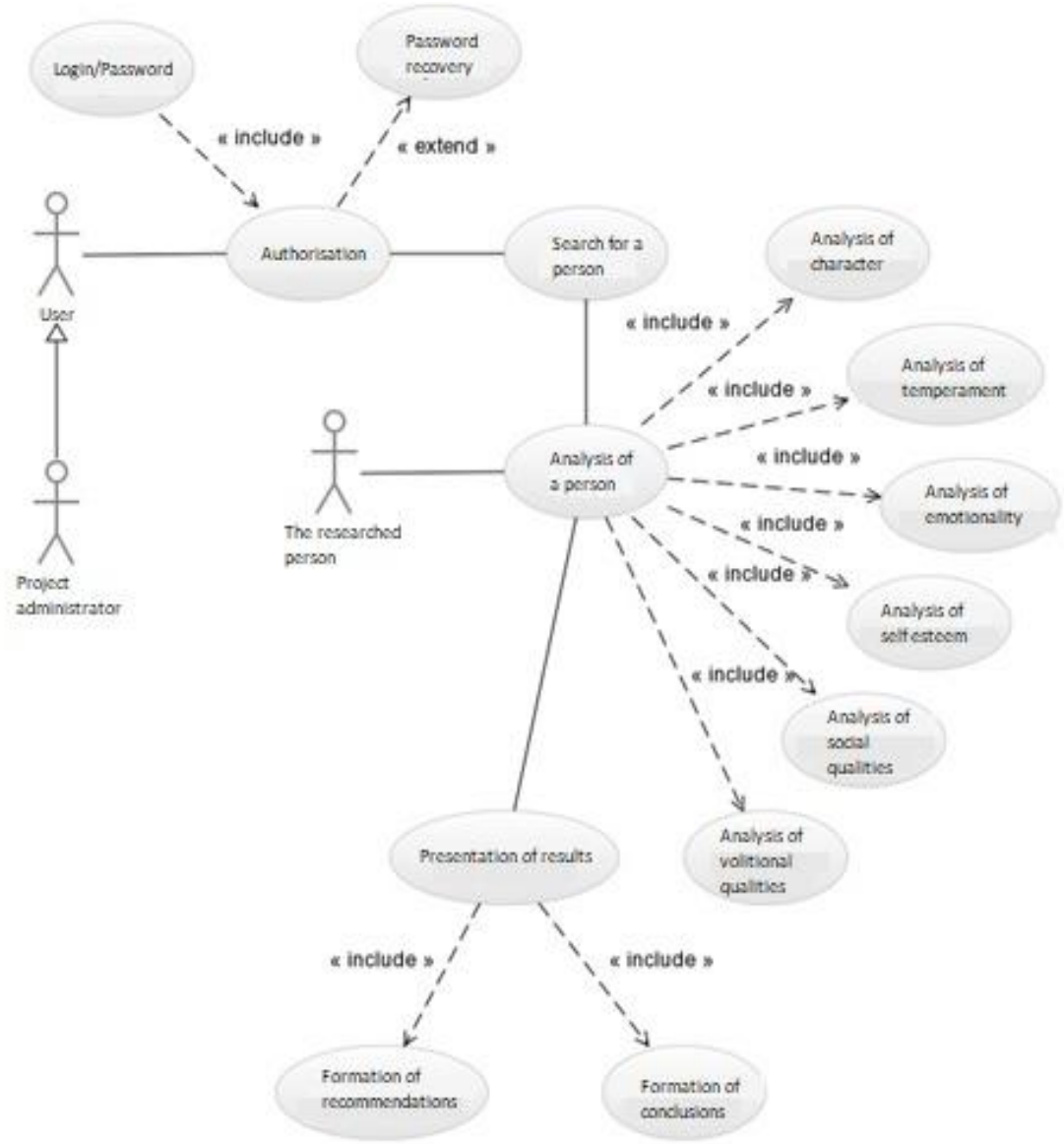


Figure 7: Use case diagram

5. Scenario Extensions or Alternative Streams:
    a. Invalid person ID
        I. The IP searches and displays the account of the person found (this is the point of return to the main scenario).
        II. The user re-enters the correct person identifier.
        III. If necessary, the user can ask the IP and obtain (as a hint) the complete list of possible person identifiers (for example, those that begin with a specific number or letter).
        IV. The IP notifies the user of the error and cancels the input of the requested person.
    b. No person found

I. If the person is not found again, the IC notifies the user of the error and returns to the initial state.
II. If necessary, the user can ask the IP and obtain (as a hint) the complete list of possible person identifiers (for example, those that begin with a specific number or letter).
III. The IP notifies the user of the error and cancels the input of the requested person.

c. Person restricted access to their data
I. The IP queries the search for another person or returns to its original state.
II. The IP notifies the user of an access error.

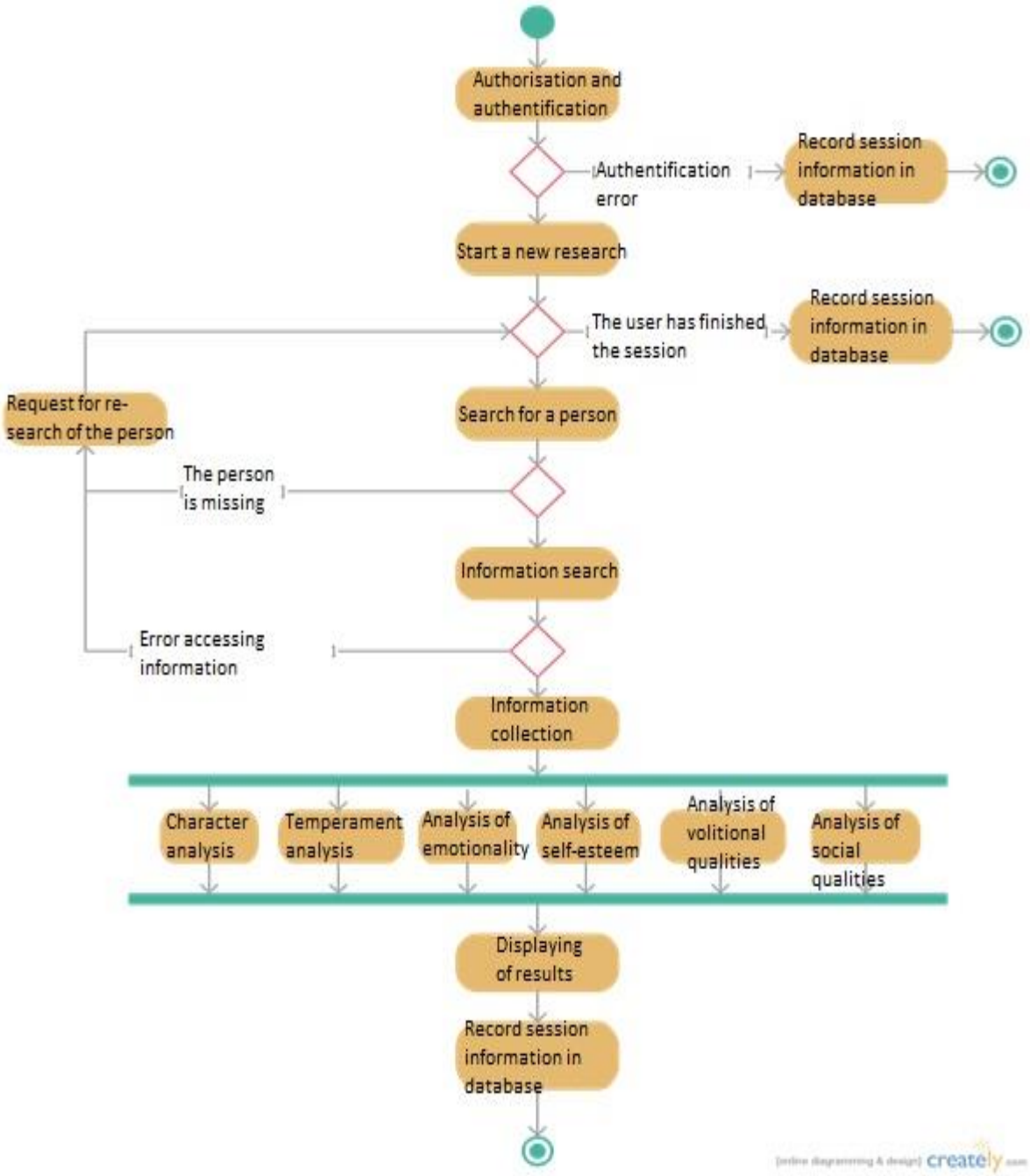


Figure 8: Activity diagram

6. Post-conditions: this is a list of conditions that must always be met in the case of successful execution of the main scenario (i.e., when the interests of all interested parties under item 2 are satisfied), for example:
    a. The session has successfully recorded in the IP database.
    b. The user has completed this session.
    c. The necessary recommendations and conclusions are presented.
    d. Data on psychological analysis of personality are processed and saved in IP.
7. Special scenarios:
    a. Provide special access to a privileged group of users to correct malfunctions.
    b. Ensure that all sessions are as reliable as possible.
    c. Ensure that the IP user interface is localised.
    d. Provide 100% data storage capability.
8. List of necessary technologies and additional devices:
    a. IP must be developed for all existing desktop and mobile operating systems.
    b. IP must be submitted as an application for all existing browsers.
    c. IP should be designed as a WEB-oriented system.

A sequence diagram describes a process of psychological analysis of a person initiated by a particular user of the system. The user logs in and queries the person's search database. The IS finds the person, processes the data and returns the result. Before shutting down, the system records this session to its database (Fig. 9).

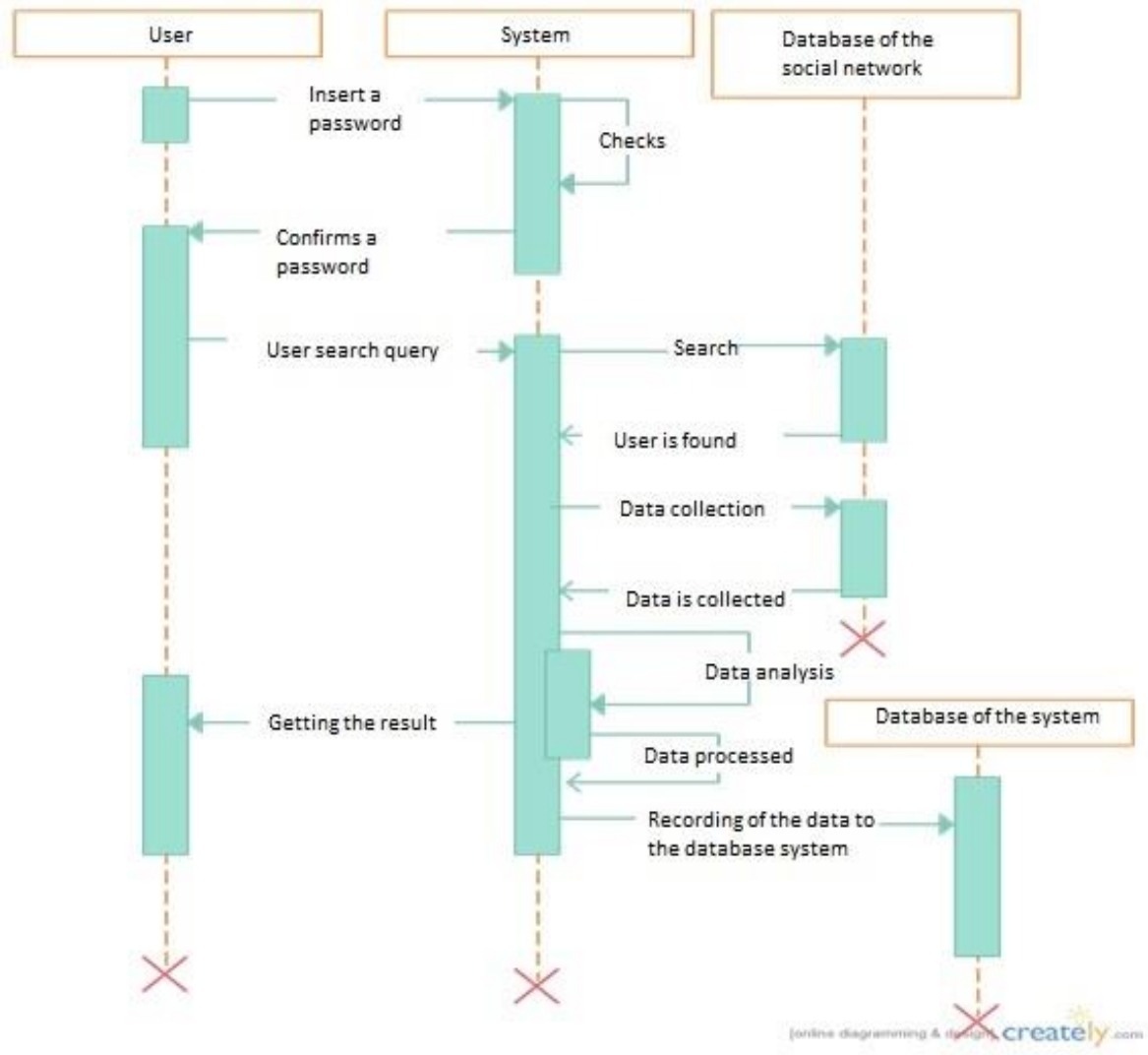


Figure 9: Sequence diagram

Fig. 10 shows an example of a commented UML dependency packet diagram that depicts a typical WEB-based IC architecture for working with a database and system decision logic.

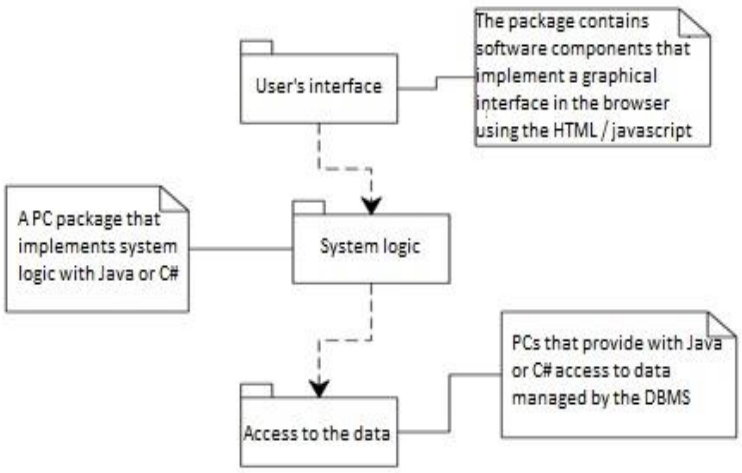


Figure 10: Package diagram

4.2. Functional point's analysis

We distinguish the functions of the software and count the number of factors:

1. External inputs: Three (practical recommendations, methods of psychoanalysis, ways of presenting results).
2. External outputs: Three (psychological portrait, study error information, research-based recommendations).
3. External requests: One (classification of psychological types).
4. Internal logical files: Two (preliminary analysis data, personal account data).
5. External logical files: Three (text, data from other social networks, data on Internet activity).

The resulting values are then multiplied by the complexity coefficients for each factor (according to IFPUG) and are summarised. The importance of these coefficients is given in Table. 4.

Table 4
The value of the coefficients of complexity

Odds	Difficult	Medium	Easy
Exterior entrances	6	4	3
External requests	6	4	3
Internal logical files	15	10	7
Exterior entrances	7	5	4
External logical files	10	7	5

Accordingly, the considered example in Table 5 shows the parameter values.

Table 5
Example parameter values

	Easy		Medium		Difficult	
	Number	Coefficient	Number	Coefficient	Number	Coefficient
Exterior entrances	1	3	1	4	1	6
External requests	1	3	0	4	0	6

Internal logical files	1	7	1	10	0	15
Exterior entrances	1	4	1	5	1	7
External logical files	1	5	1	7	1	10

Function Size:

$$AF = 1 \times 3 + 1 \times 4 + 1 \times 6 + 1 \times 4 + 1 \times 5 + 1 \times 7 + 1 \times 3 + 1 \times 7 + 1 \times 10 + \\ + 1 \times 5 + 1 \times 7 + 1 \times 10 = 71.$$

This number is a preliminary estimate and needs correction by assigning weights (0 to 5) to each project characteristic. In addition to the functional requirements of the product are imposed system-wide requirements that limit developers in the choice of solution and increase the complexity of development. An equalisation factor (VAF) is used to account for this complexity. The VAF factor depends on 14 parameters that determine the system characteristics of the product. These 14 system parameters (degree of influence, DI) are rated on a scale of 0 to 5. For the example considered, these characteristics are given in Table 6.

Table 6

Example of characteristic values

No	Characteristic	Value
1	Communication	1
2	Distributed data processing	3
3	Productivity	0
4	Hardware limitations	2
5	Transaction load	3
6	Intensity of user interaction	5
7	Ergonomics (end-user performance)	5
8	Flexibility	3
9	Complexity of processing	4
10	Reuse	4
11	Ease of installation	5
12	Ease of administration	3
13	Need for multiple installations in different conditions	5
14	The intensity of data change (ILF) by users	3

Calculating the total effect of 14 system characteristics (total degree of influenza, TDI) is a simple summation of 46. The formula calculates the specified available size:

$$VAF = AF \times (0.65 + 0.01 \times TDI)$$

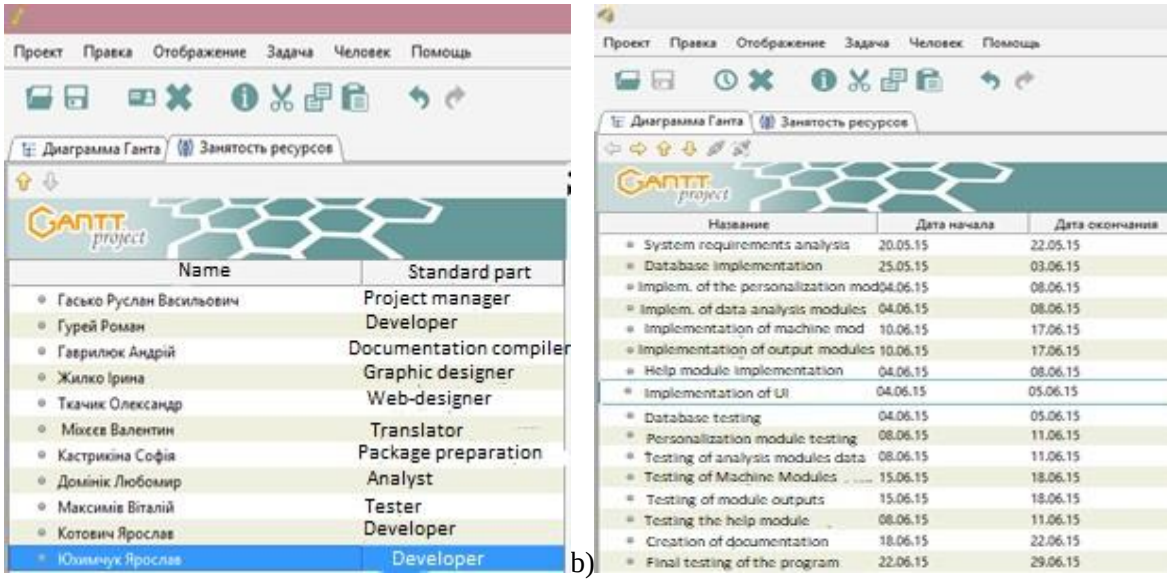
and is as follows:

$$VAF = AF \times (0.65 + 0.01 \times 29) = 66.74.$$

The resulting VAF value can then be converted to a unit of measure (code line number, SLOC), or a performance factor can be estimated because of FP per day (Performance factor), based on which project complexity can be estimated.

4.3. Work scheduling in the Gantt Project software

The Gantt Project software allows you to visually analyse the development of a particular software product or system and properly allocate the resources and time of project staff. The tool avoids unwanted anomalies such as untimely completion of the project, misallocation of forces and more. The primary step is to subdivide the project into sub-tasks and identify their executors (Fig. 11).



a) b)

Figure 11: a) List of project participants and b) subdivision of the project

After all the subtasks are created, we get the diagram shown in Fig. 12. It is also possible to review and check whether the resources in the project were allocated correctly (Fig. 13).

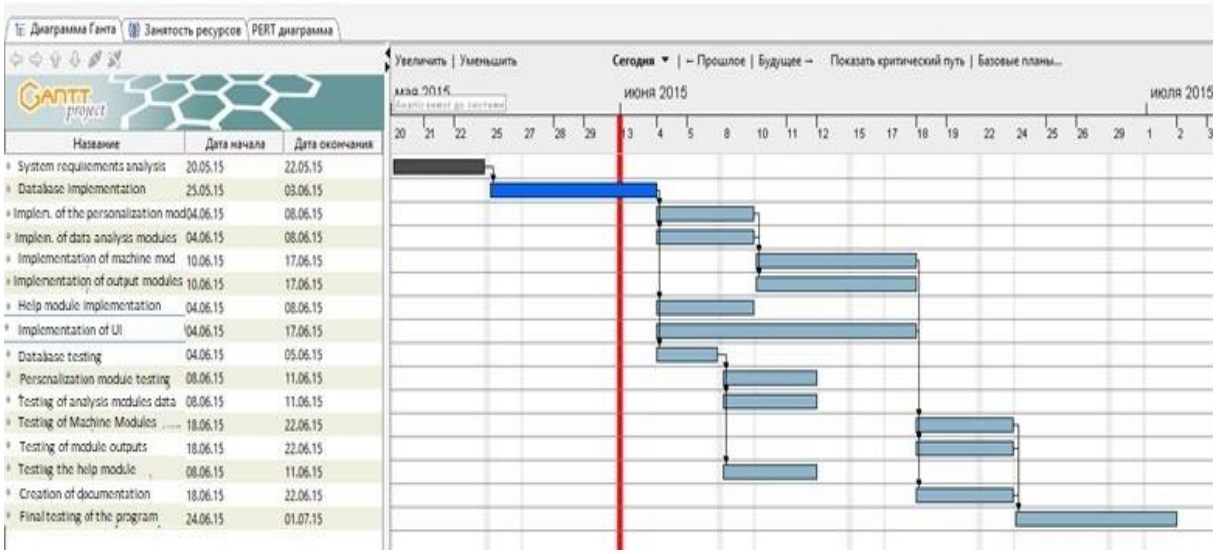


Figure 12: Gantt chart

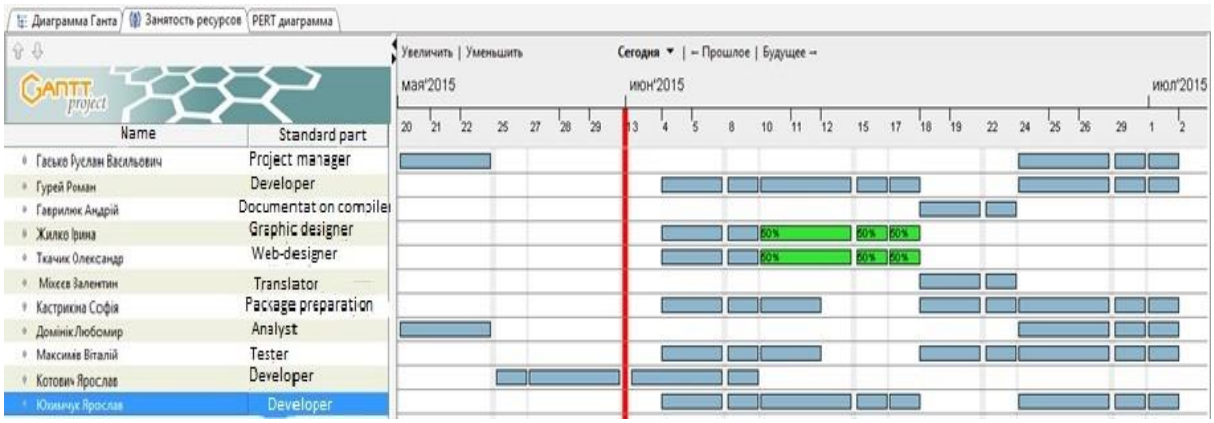


Figure 13: Allocation of resources in the project

For all the above actions, we obtain a PERT diagram showing the sequence of software creation processes as a result (Fig. 14).

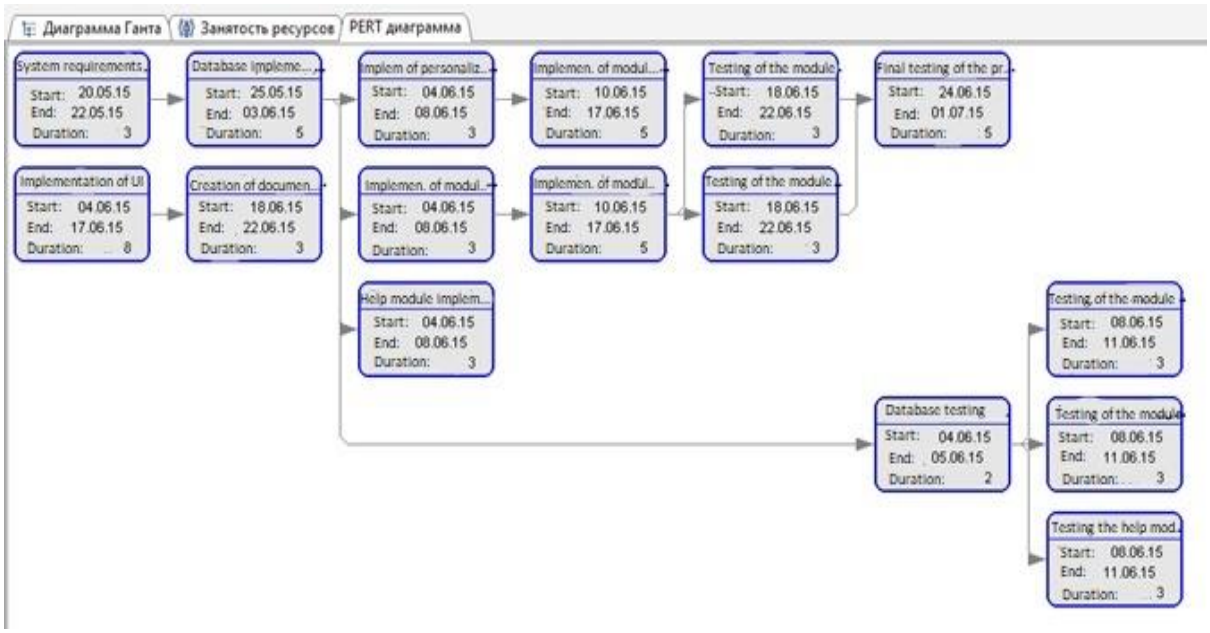


Figure 14: PERT diagram

Choosing a software design methodology is a critical point in developing IP analysis of a person's psychological state (Fig. 15). The design process determines which ways and ways the system will be implemented. It describes the sequence of work and the distribution of labour. By choosing the correct methodology, you can develop optimal options for creating an information system. This IP will be geared towards Internet applications, so the choice of tools and implementation tools considered the technologies that will allow you to implement the required software product. For a long time, not all Internet technologies had a defined standard. Of course, with the advent of HTML5 and CSS3 and the release of Microsoft's MS Edge browser, the situation is changing dramatically. However, there is still a problem with the backward compatibility of sites. When choosing an architectural solution, it is necessary to use two parts, server and client. Both pieces are closely linked and function as one. However, processing of the primary process will take place in the server part (Fig. 16).

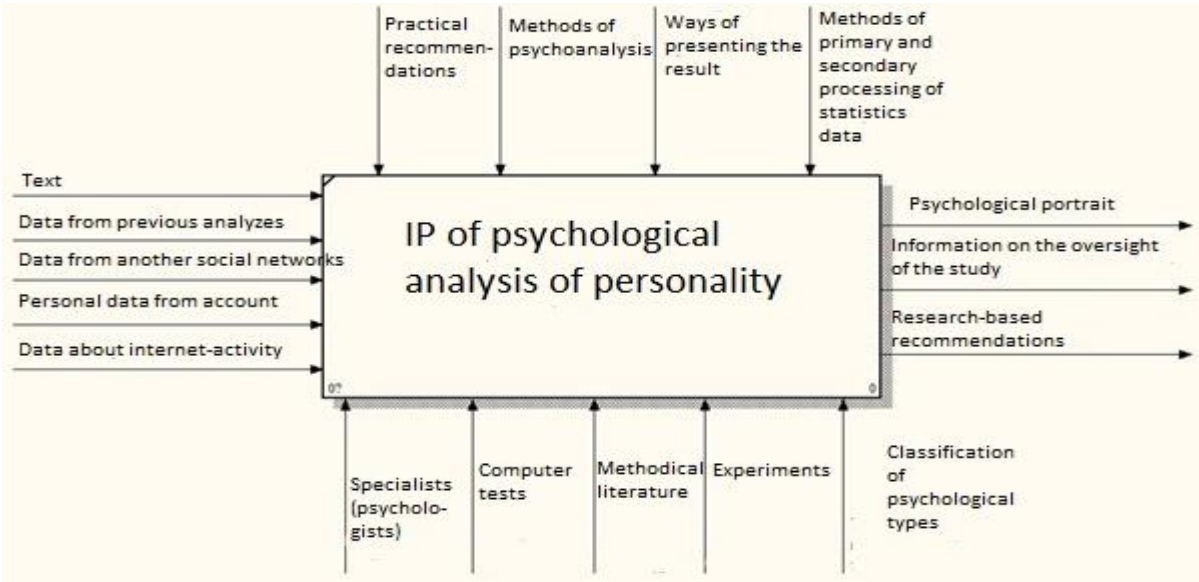


Figure 15: Context IDEF0 diagram for the specified process

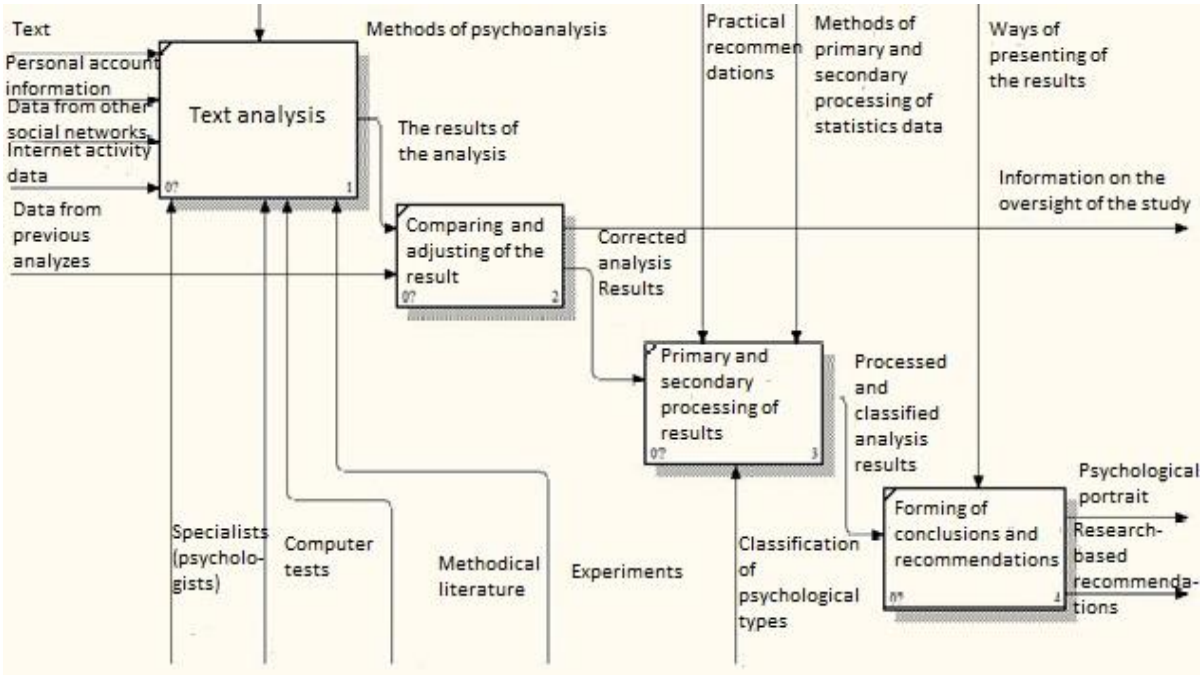


Figure 16: IDEF0 diagrams for primary process subtasks (IDEF0 decomposition)

In this case, the server hardware is a remote server. There is no need to create a separate server for the project because the program does not have data processed on the server-side. In the future, its implementation is necessary. The client part will be contained on the user's device (PC, laptop, tablet or another device) and displayed in the browser. When designing a Web site, you should consider how it behaves on different devices, with varying diagonals of the screen and other browsers. Recently, tablets and smartphones have become particularly popular as the most mobile devices. Viewing the content on the therefore, the so-called cross-platform and cross-browser are used to solve these problems.

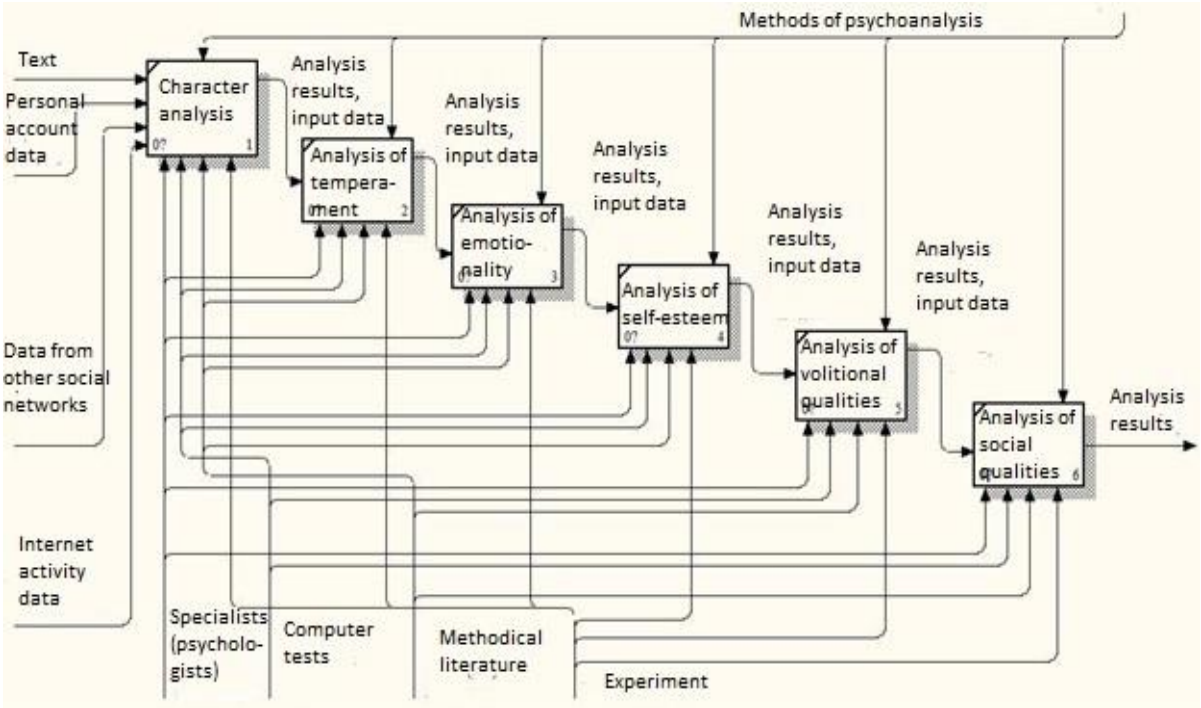


Figure 17: IDEF0 diagrams for main process tasks (Text Analysis block decomposition)

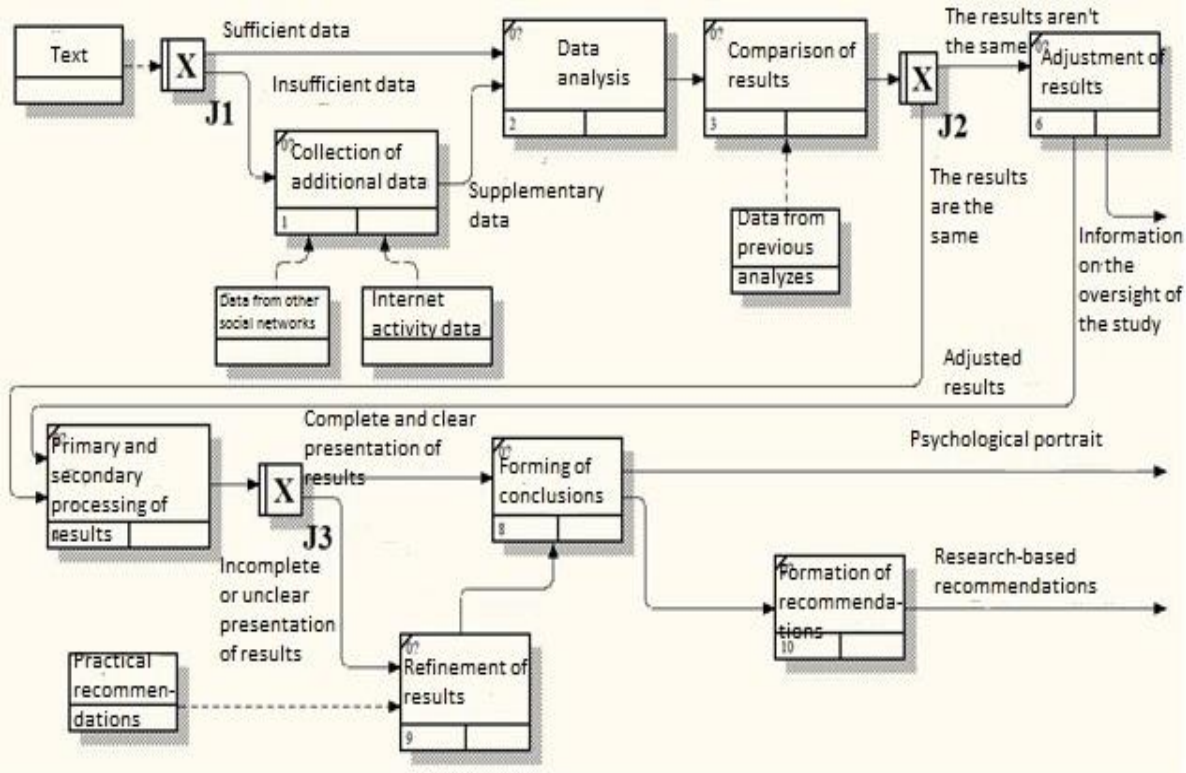


Figure 18: Systematic scripts - IDEF3 charts.

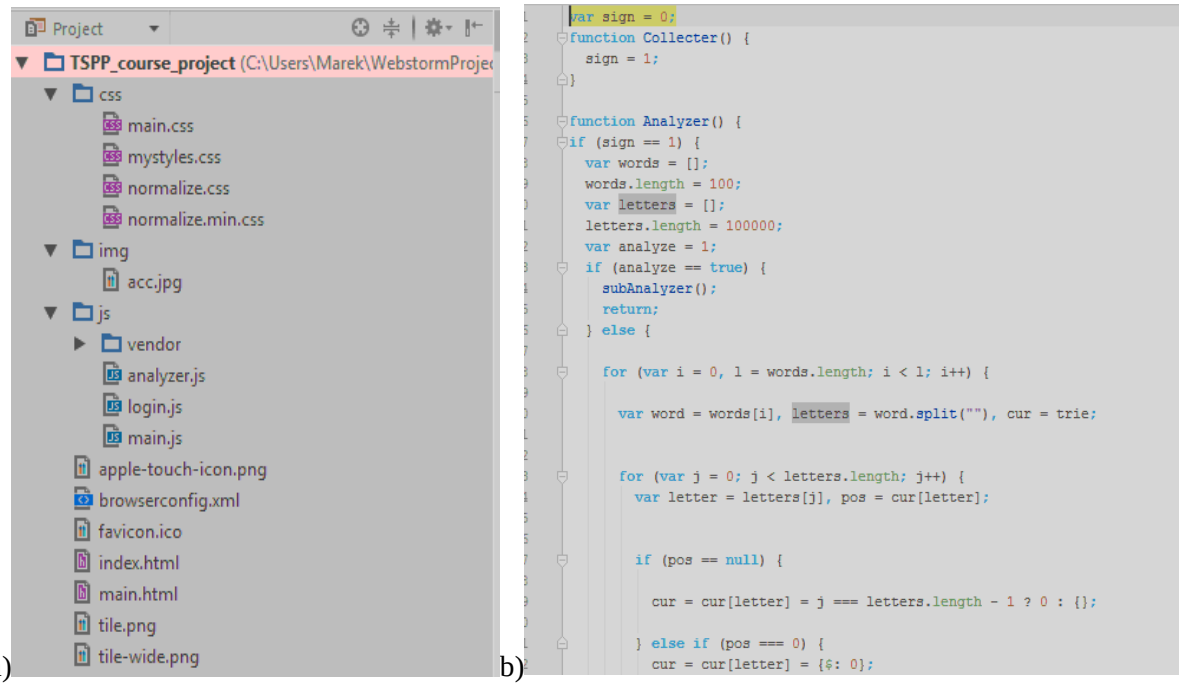
Cross-platform allowed to adapt the website to screens with small diagonals and focused on the site only the most necessary content of the result of the analysis of the person's psychological state. It reduces the load time of the web page, which is one of the critical points. Cross-platforming can be achieved through media queries and the use of "rubber" layouts. A Cross-browser is designed to make the site appear the same on all popular browsers, as each browser has its technologies for implementing specific functions. Therefore, different individual scripts and requests are used to make the site look the same in any browser. Today, the following are popular: Google Chrome; Mozilla Firefox; Opera; Safari; Internet Explorer; Microsoft Edge.

The situation will finally change with the release of Windows 10 and the new Microsoft Edge browser. The new browser promises to get around even the current leader Google Chrome. In addition, it will support all the modern WEB standards. The next step is to choose a software solution.

Certainly, hypertext mark-up language (HTML) and cascading style sheets (CSS) will be used when designing any web site. As virtually all browsers have recently started to support the basic standards, it is worth paying attention to versions of these technologies, namely HTML5 and CSS3, which prevent the use of outdated technologies such as Flesh on the site. Writing programs is stopped in JavaScript, which has been popular with web developers in recent years. Therefore, the following technologies are selected to create the page layout (otherwise called front-end): HTML5, CSS3, and JavaScript. To create a back-end, you should use technologies such as PHP programming language and MySQL commands. The implementation of the software is performed using the following three software components: HTML, CSS and JavaScript. HTML is required to create the site structure. CSS is a language that defines a website's visual appearance; JavaScript is a programming language needed to implement what cannot achieved in CSS and provide site interactivity. The main file is the index.html file, which is the site's main page (Fig. 19).

All major blocks of the site will placed in so-called containers. They are required to centre the content on a web page (Fig. 20-21). They are described all in the main CSS file.

JavaScript must use to create features such as user authorisation and word statistics, as the visual appearance and content of some of the blocks on the site changes during the execution process. This cannot implemented with cascading styles only. In addition, certain values and identifiers are created in the process, which are necessary for the proper functioning of the program.



a) b)

Figure 19: Web site structure

After creating all the necessary features, we get a site template, which, after testing, is ready for use (Fig. 22-23). Fig. 24 shows a diagram of an IC database for the analysis of a person's psychological state. By analogy with the definition of the amount of information, we introduce the following concepts. The level of awareness of the decision-maker (ODA), i.e. the doctor, indicates the expert's level of knowledge about the subject of analysis or research.

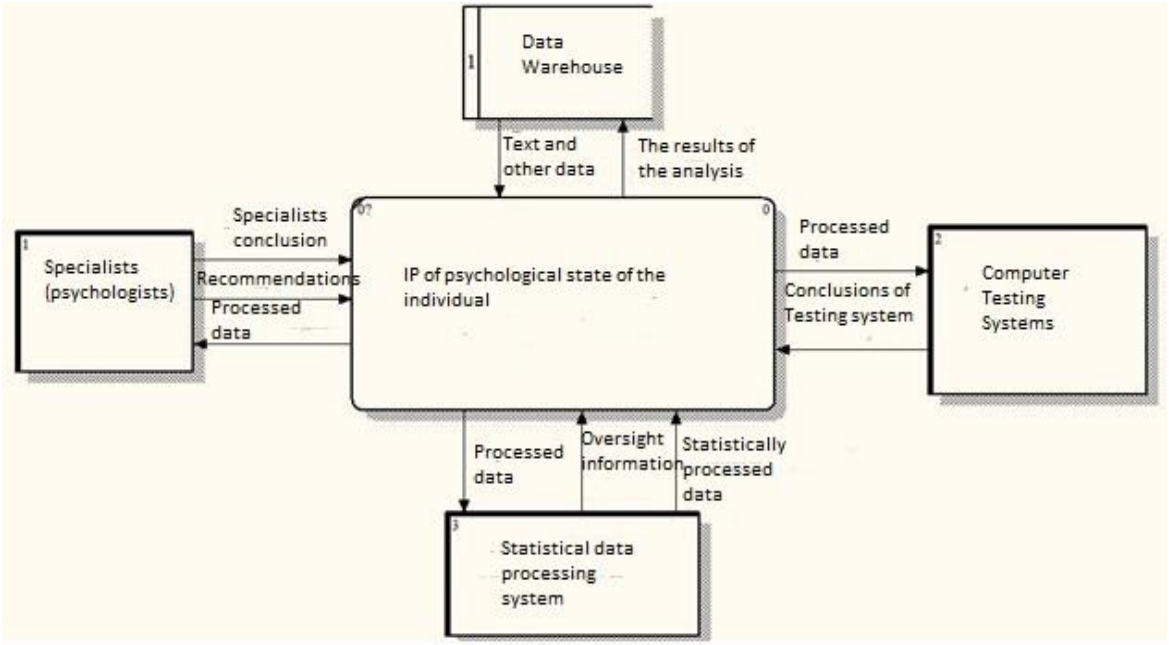


Figure 20: DF diagrams

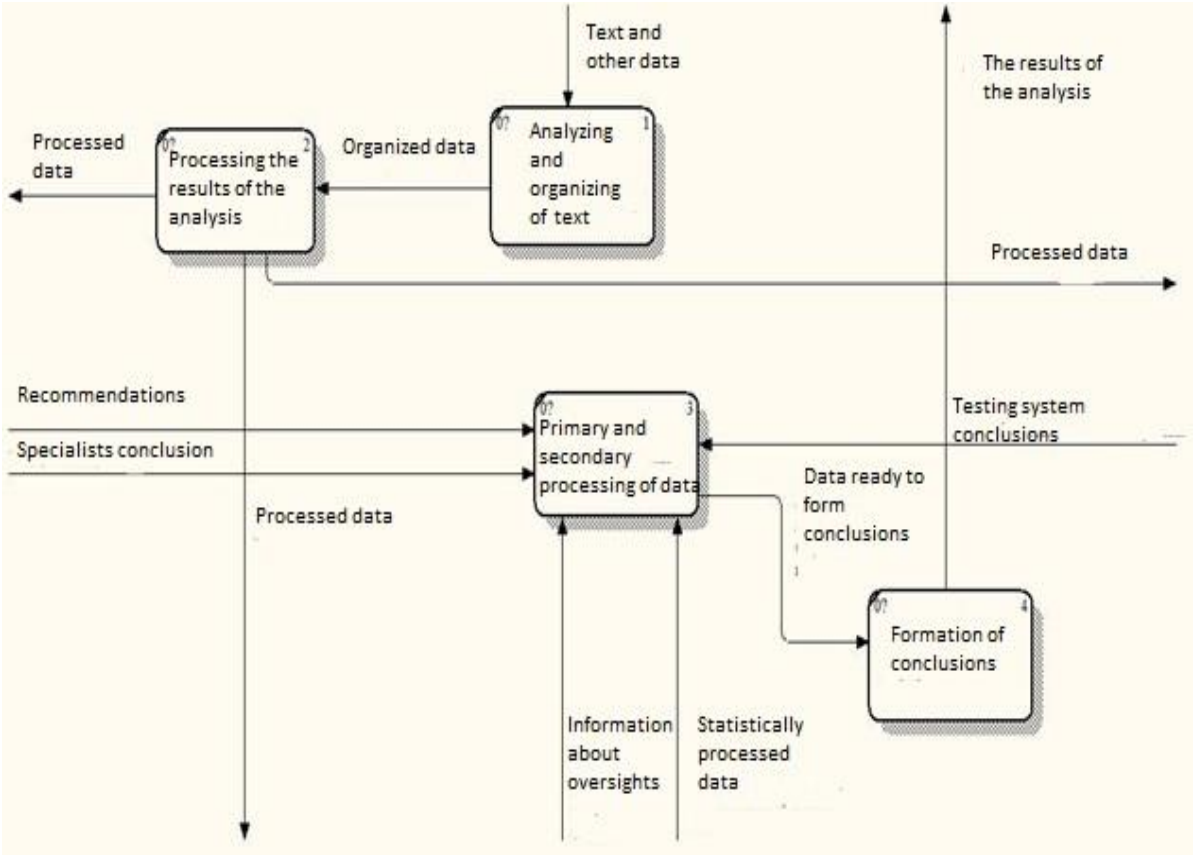
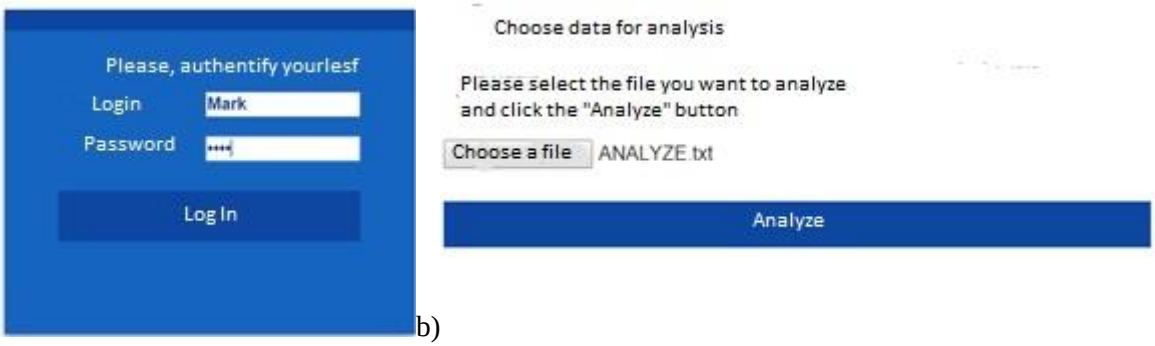


Figure 21: DF diagrams (decomposition)



a) b)

Figure 22: a) User authentication and b) File selection process

Interpretation of the analysis results
The most unambiguous results are at the list)
-This person thinks broadly. Feels the flight of fantasy.
-You will not call this man as a weak
-An open person
-Life tone is excellent
- Some carefulness is inherent
-Ready status. Self-dedicated person
-This person has a purpose for which it is ready for anything
-There is a certain passivity inherent
-Likes comfort
-A person whose confidence is very easy to gain.

Figure 23: The process of interpreting the results of the analysis.

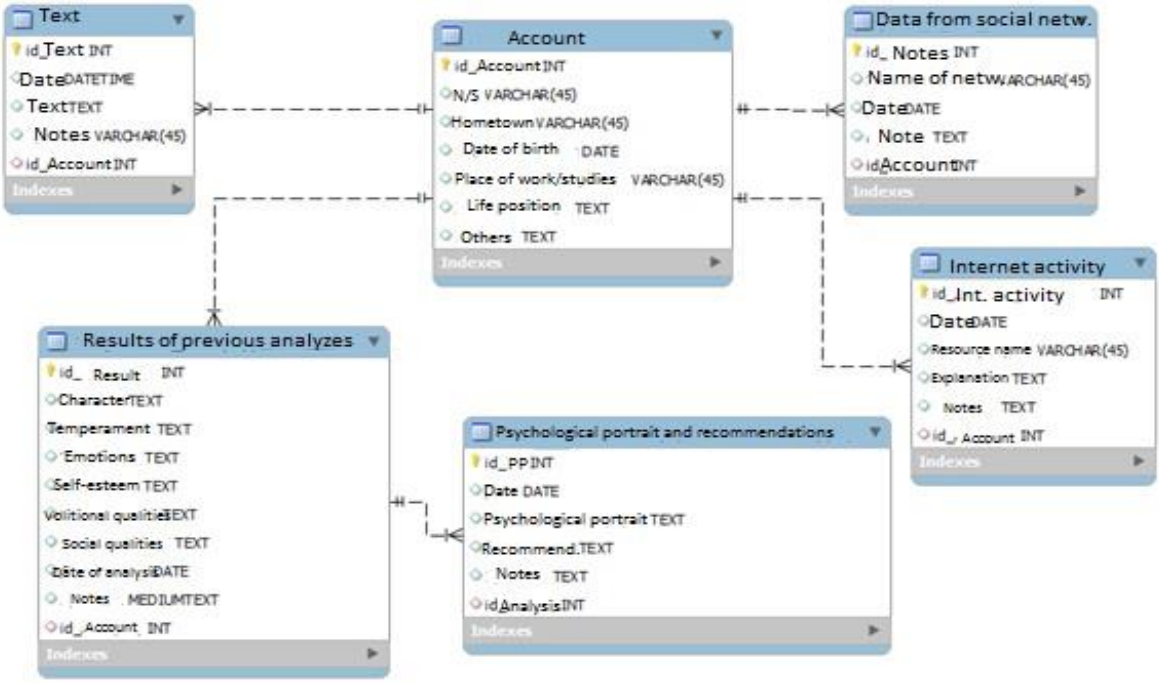


Figure 24: Database. (EER diagram)

Quantitatively, the level of awareness of ODA will be characterised by the magnitude of the change in the level of uncertainty of knowledge of obtaining information. Understanding ATS means a difference in the level of uncertainty about the situation or subject of analysis of receiving information as a result. With the receipt of data, the level of uncertainty of the problem may decrease if the notification is accurate but may increase if it is deliberately distorted or untrusted (i.e. not confirmed by experience, calculations, documents or otherwise). In addition, the uncertainty of the situation can be assessed based on the objectives of systematic analysis, particularly in terms of determining the extent and level of risk. For each condition, the following types of uncertainty of knowledge characterise:

- associated with the possibility of a situation;
- described by the quality of available and new information received;
- related to the degree of impact of a problem on the level of risk.

It follows that raising the level of awareness of ODA does not always lead to the disclosure of the uncertainty of the occurrence of a particular situation, as it was accepted during the formation of relation (1) [21-33]. Therefore, it is advisable to determine the level of awareness of ODA, considering all the above factors. First, let's define the inverse of the level of understanding. Formula (1) establishes an entire group of random events or random states [21-33]. It is taken into account that entropy is the inverse of the amount of information. The value of H is a measure of the uncertainty of a set consisting of n random events with probabilities $p_1,\ldots,p_n$. Formula (1) follows that H = 0 provided that only one event will occur from the set of circumstances, and other events can't coincide [21-33]. Such condition is fulfilled in the consecutive transmission of the message in letters [21-30].

$$H = -\sum_{i=1}^{n} p_i \log p_i. \quad (1)$$

We analyse the impact of the quality of information on the level of awareness of ODA. It should be noted that the assessment of the quality of data is the least studied in both computer science and other disciplines, one way or another related to information: the theory of optimal management, the idea of decision making, and so on. Today there is no accepted system of indicators for assessing the quality characteristics of information. Therefore, it is not advisable to dwell on the analysis of the various approaches to formalising them since they do not apply to the solution of most practical system analysis problems. Here are only the essential qualitative properties of information crucial to system analysis tasks, particularly for assessing the degree and level of risk in common, freelance, and critical situations. The definitions in Table 7 should be taken into account when defining ODA awareness indicators [21-33].

Table 7
The main qualitative properties of information for the psychological analysis of a person

No	Name	Definition
1	Uncertainty	a property that reflects the presence of several alternative descriptions of the situation
2	Inaccuracy	a property indicating that there is a specific interval of tolerances or errors in measurements or calculations in the quantitative parameters and/or qualitative characteristics of the situation description
3	Incomplete	a property that reflects the presence of information gaps in the description of the situation (something missed, not described enough, etc.)
4	Blurred	a property that characterises the vagueness of describing a situation where it is impossible to accurately determine the presence or absence of a particular property or its exact quantitative characteristic (for example, it is unbelievable to quantify concepts such as comfortable weather, favourable situation accurately - their description is subjective, vague)
5	Timeliness	property that characterises the relationship in time between the moment of occurrence of an event and the moment of receipt of information about it; If ODA does not have enough time to form and make decisions based on the information received, then it is untimely
6	Unreliability	a property that reflects the presence of quantitative data or qualitative characteristics that do not correspond to the actual state of the situation
7	Controversy	a property that indicates the presence of quantitative or qualitative characteristics that have meaning or content that contradicts other data

Let's analyse some techniques and the essence of the uncertainties of the occurrence of situations. We will assume that the level of non-awareness is the uncertainty of knowledge about the emergence of an alternative from the predicted set of problems. The anticipation of expertise can be estimated based on different approaches. Let the set of possible situations M_s is discrete, and each element S_i of the set M_s characterises a certain probability p_i for $i = \overline{1, m_s}$ Then the value of non-awareness H_s will be defined as the level of uncertainty of information about M_s. Therefore, we have a condition similar to that for formula (1) [21-30]. Therefore, uncertainty can be defined as entropy

$$H_S = -\sum_{i=1}^{m_s} p_i \log p_i \quad (2)$$

Note that for equally probable events $p_i = 1/m_S$ and $H_S = \log m_S$ [21-30].

In the process of functioning of the system $F = \{F_j | j = \overline{1, m}\}$ under the influence of many uncontrolled risk factors F_j, the staff situation S_i can turn into a critical, emergency or catastrophic [21]. Such a transition may occur over some time, the duration of which is unknown at a priori and which depends on the number, properties and duration of the influence of the factors $F_j \in F$. It is necessary to determine such a permissible period T_0 for the formation and implementation of a solution for which the probability of a situation S_i transition to a critical, emergency or catastrophic one will not exceed the set value $\eta = \eta_{add}$. The number of risk factors and situations will be given in Table 8, where the "+" sign means that when the relevant factor influences the staff situation becomes critical, emergency or catastrophic, and the "-" sign does not affect the case. Note that the method and algorithm for solving the problem are applicable to finite values *i* and *j*.

The likelihood of a situation S_i transitioning under the influence of a factor $F_j \in F$; $j \in [1; 7]$ in a critical, emergency or catastrophic situation depends on the change in the timing of completeness I_P^{ij}, reliability I_D^{ij} and timeliness I_T^{ij} of ODA awareness. The probability η_{ij} of such an event determines the ratio [21]:

$$\eta_{ij} = 1 - lg\left[1 + \alpha_{ij} I_{ij}(t)\right]; I_{ij}(t) = I_P^{ij}(t) I_T^{ij}(t) I_D^{ij}(t).$$

Table 8
Risk factors that affect the transition of a staff situation to a critical or catastrophic one

Φj / Si	Errors in the text	Incorrect timeframe	Database failure	Absence of appropriate specialist	Lack of relevant literature	Test failed	Incorrect practice guidelines
Text Analysis	+	+	+	+	+	+	-
Compare and adjust results	+	+	+	-	-	-	-
Primary and secondary processing of results	+	-	-	-	+	-	+
Forming conclusions and recommendations	+	-	-	+	-	-	+

To make a decision, it is necessary to find a rational compromise between levels $I_P^{ij}, I_D^{ij}, I_T^{ij}$ to shorten the time for its formation and implementation [21]. The indicators of completeness I_P^{ij} and reliability I_D^{ij} of ODA awareness increase over time and are defined by the following conditions [21]:

$$I_P^{ij}(t) = \begin{cases} \hat{I}_P^{ij}\left(1+\alpha_{ij}t\right), & if\ 0 < \hat{I}_P^{ij}\left(1+\alpha_{ij}t\right) < 1, \\ 1, & if\ \hat{I}_P^{ij}\left(1+\alpha_{ij}t\right) \geq 1; \end{cases}$$

$$I_D^{ij}(t) = \begin{cases} \hat{I}_D^{ij}\left(1+\gamma_{ij}t\right), & if\ 0 < \hat{I}_D^{ij}\left(1+\gamma_{ij}t\right) < 1, \\ 1, & if\ \hat{I}_D^{ij}\left(1+\gamma_{ij}t\right) \geq 1. \end{cases}$$

At the same time as the time of influence of factors $F_j \in F$ decreases the level of the indicator of timeliness of awareness I_T^{ij} according to its properties which characterises the ratio

$$I_T^{ij}(t) = \begin{cases} \hat{I}_T^{ij}\left(1-\beta_{ij}t^2\right), & if\ 0 < \beta_{ij}t^2 < 1, \\ 0, & if\ \beta_{ij}t^2 \geq 1. \end{cases}$$

Therefore, the length of time for the formation, adoption and implementation of the ODA decision is reduced to prevent the transition of the investigated situation to a critical, emergency or catastrophic one. The coefficients α_{ij}, β_{ij}, γ_{ij} characterise the dynamics of changes in awareness indicators. They are determined by the dependencies [21]:

$$\alpha_{ij} = \begin{cases} e^{\hat{\alpha}_{ij}}\hat{I}_P^{ij}0{,}5, & if\ 0 < \alpha_{ij} \leq 1, \\ 0, & if\ \alpha_{ij} > 1; \end{cases}$$

$$\beta_{ij} = \begin{cases} \left(\hat{\alpha}_{ij}+\gamma_{ij}\right)\hat{I}_T^{ij}10^{-5}, & if\ 0 < \hat{\alpha}_{ij}+\gamma_{ij} \leq 1, \\ 0, & if\ \hat{\alpha}_{ij} > 1. \end{cases}$$

$$\gamma_{ij} = \begin{cases} e^{\hat{I}_D^{ij}}\hat{\alpha}_{ij}0{,}05, & if\ 0 < \hat{\alpha}_{ij} \leq 1, \\ 0, & if\ \hat{\alpha}_{ij} > 1. \end{cases}$$

The values $\hat{I}_P^{ij}, \hat{I}_D^{ij}, \hat{I}_T^{ij}$ are preliminary estimates of the relevant indicators, which experts determine at the time of detection of a freelance model of operation of the system [21], and the coefficients $\hat{\alpha}_{ij}$

characterise the influence level of each of the factors $F_j \in F; j \in [1; 7]$ on the properties of situations S_i, $i \in [1; 4]$. The values of indicators $\hat{I}_P^{ij}$, $\hat{I}_D^{ij}$, $\hat{I}_T^{ij}$ and coefficient $\hat{\alpha}_{ij}$are given in Table 9.

Table 9

The values of indicators $\hat{I}_P^{ij}$, $\hat{I}_D^{ij}$, $\hat{I}_T^{ij}$ and coefficient$\hat{\alpha}_{ij}$

Φj / Si	F_1	F_2	F_3	F_4	F_5	F_6	F_7
			$\hat{\alpha}_{ij}$				
S_1	0.40	0.65	0.85	0.60	0.50	0.75	-
S_2	0.45	0.70	0.80	-	-	-	-
S_3	0.50	-	-	-	0.60	-	0.60
S_4	0.55	-	-	0.75	-	-	0.60
			$\hat{I}_P^{ij}$				
S_1	0.50	0.65	0.85	0.65	0.55	0.75	-
S_2	0.55	0.70	0.85	-	-	-	-
S_3	0.60	-	-	-	0.65	-	0.70
S_4	0.65	-	-	0.80	-	-	0.70
			$\hat{I}_D^{ij}$				
S_1	0.55	0.70	0.90	0.70	0.60	0.80	-
S_2	0.60	0.80	0.85	-	-	-	-
S_3	0.65	-	-	-	0.65	-	0.75
S_4	0.70	-	-	0.80	-	-	0.70
			$\hat{I}_T^{ij}$				
S_1	0.60	0.80	0.90	0.75	0.65	0.80	-
S_2	0.65	0.90	0.90	-	-	-	-
S_3	0.70	-	-	-	0.70	-	0.80
S_4	0.75	-	-	0.85	-	-	0.75

$$\alpha_{ij} = \begin{Vmatrix} 0{,}375 & 0{,}627 & 1{,}004 & 0{,}596 & 0{,}456 & 0{,}801 & 0 \\ 0{,}434 & 0{,}711 & 0{,}955 & 0 & 0 & 0 & 0 \\ 0{,}497 & 0 & 0 & 0 & 0{,}596 & 0 & 0{,}642 \\ 0{,}567 & 0 & 0 & 0{,}854 & 0 & 0 & 0{,}642 \end{Vmatrix}$$

$$\gamma_{ij} = \begin{Vmatrix} 0{,}033 & 0{,}063 & 1{,}00 & 0{,}058 & 0{,}044 & 0{,}080 & 0 \\ 0{,}039 & 0{,}071 & 0{,}095 & 0 & 0 & 0 & 0 \\ 0{,}046 & 0 & 0 & 0 & 0{,}058 & 0 & 0{,}061 \\ 0{,}053 & 0 & 0 & 0{,}084 & 0 & 0 & 0{,}061 \end{Vmatrix}$$

$$\beta_{ij} \cdot 10^{-4} = \begin{Vmatrix} 0{,}260 & 0{,}570 & 0{,}855 & 0{,}493 & 0{,}353 & 0{,}664 & 0 \\ 0{,}318 & 0{,}694 & 0{,}805 & 0 & 0 & 0 & 0 \\ 0{,}382 & 0 & 0 & 0 & 0{,}461 & 0 & 0{,}529 \\ 0{,}452 & 0 & 0 & 0{,}709 & 0 & 0 & 0{,}496 \end{Vmatrix}$$

To determine the length of the allowable period $T_0 = [T_1; T_2]$, where both T_1 and T_2 the lower and the upper bounds of the interval solve the inequality:

$$0 \le 1 - lg\left(1 + \alpha_{ij} I_T^{ij} I_D^{ij} I_P^{ij} (1 + \alpha_{ij} t)(1 + \gamma_{ij} t)(1 - \beta_{ij} t^2)\right) \le \eta_{add}.$$

Table 10

Valid intervals $\boldsymbol{T_0}$ for decision formation

Φj / Si	F_1	F_2	F	F_4	F_5	F_6	F_7
S_1	[0; 30.5]	[0; 40.5]	[0; 46.6]	[0; 40.2]	[0; 34.5]	[0; 40.7]	-

S_2	[0; 32.6]	[0; 44.6]	[0; 48.4]	-	-	-	-
S_3	[0; 35.9]	-	-	-	[0; 38.5]	-	[0; 39.5]
S_4	[0; 40.2]	-	-	[0; 42.4]	-	-	[0; 39.9]

For the situation, the time allowed for the formation, decision-making and implementation of the decision should not exceed T_1=34.5; for S_2-T_2=32.6; for S_3-T_3=35.9; for S_4-T_4=39.9.

Software testing is performed modularly. It is a static analysis of the program, which is the construction of a graph (Fig. 25), the elements of which are the parts of the software to be tested.

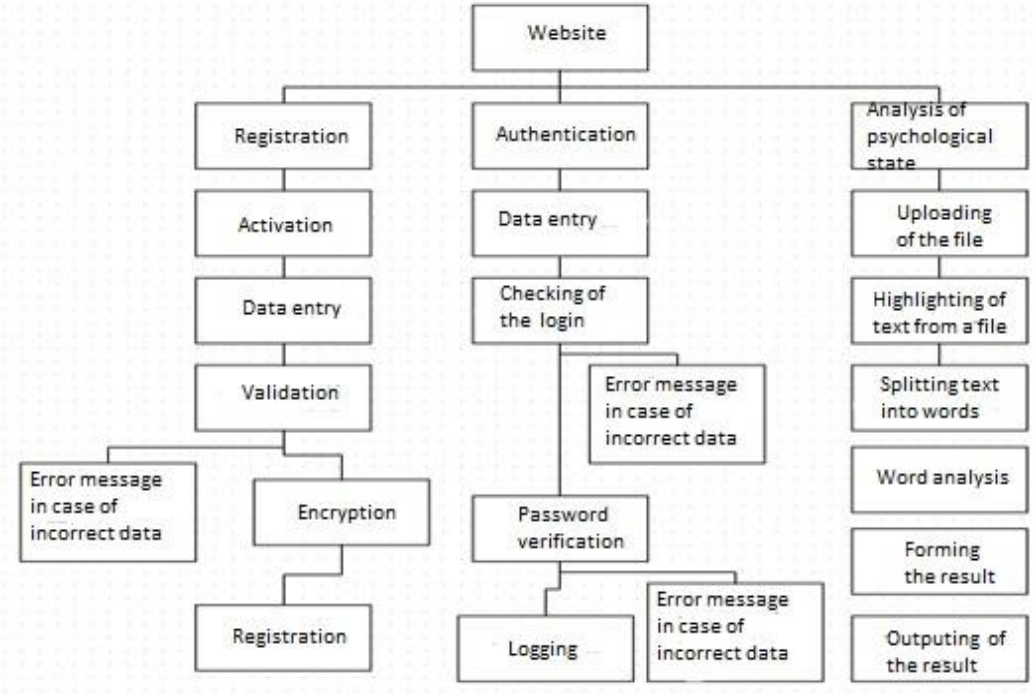


Figure 25: The managing graph

Testing of the tool will be carried out in a monolithic way (simultaneous combination of all modules that form the system into one testing complex). In the general case, if the function is not performed, it will be blocked and will need further correction. This testing method is most appropriate since there is no need to break it down into separate complexes. After developing the interface part and testing, a general overview of the resource's performance is provided. When accessing the resource, the user gets to the authorisation page (Fig. 26-27). Here is a general description of the help and the actual authorisation field. If the authorisation fails, the user will see an error.

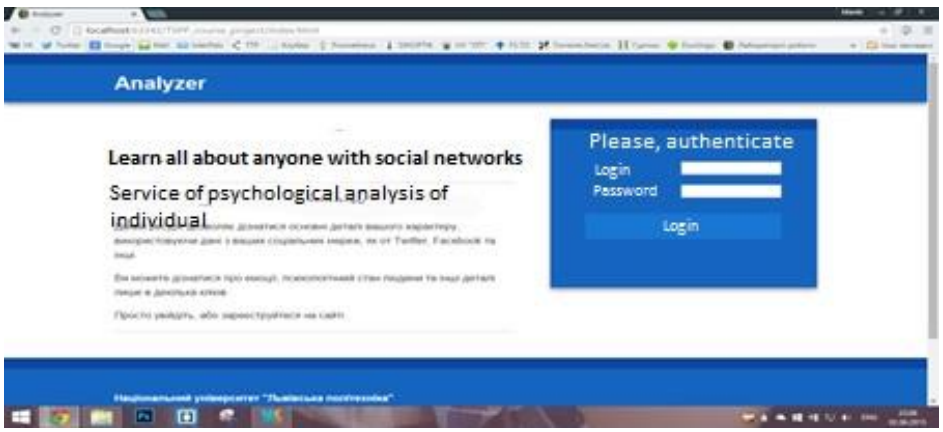


Figure 26: Authorisation on the site

After successful authorisation, the user is taken to the resource's home page, where his personal information will be displayed and a block where the user can select the file for analysis and analyse it. To analyse the text, select the text file and click the "Analyse!" Button.

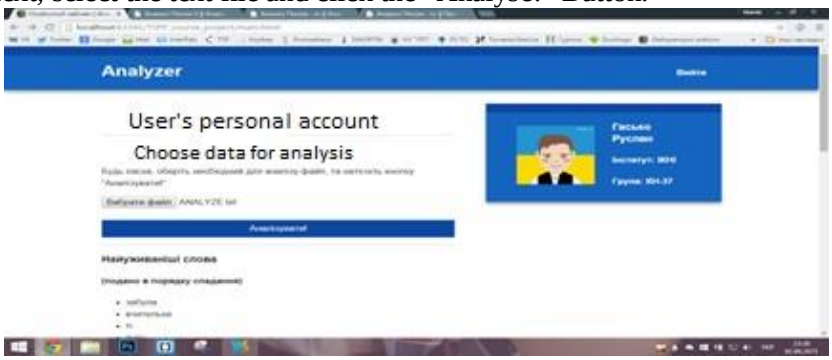


Figure 27: Main Page

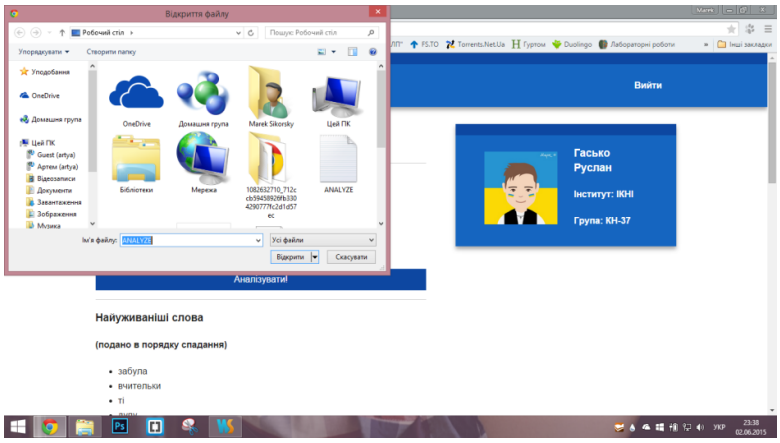


Figure 28: File Upload

File analysis in the text, as a result, the ten most used words in the text will be displayed. In addition, based on the comparison of keywords, the person's psycho-emotional state will be deduced. Therefore, the site contains only the necessary information and does not create difficulties for the user when working with it. All functions are clear and straightforward.

The most common words
(field in descending order)
-forgot
-teachers
-those
-dotty
-the task
-from under
-drink
-eyes
-I
-until

The mood of the author
(MOST SYGNIFICANT – TOP OF THE LIST)

-Open
-Powerful
-Slow
-Courageous
-Open
-Powerful

Interpretation of analysis results
(most clear results are at the top of the list)
- There is complete diligence
- The state of readiness. Self-dedication
- This person has a purpose for which he is ready for anything
- The inherent complete passivity
- Likes comfort
- A person whose confidence is very easy to gain
- This person thinks broadly. Feels the flight of fantasy.
- You will not call this person a weak one
- An open person
- Life tone is excellent

Figure 29: Output of results and interpretation of results of text analysis

5. Conclusions

In the course of the work, an information system is developed, through which it is possible to conduct a psychological analysis of a person using his messages from social networks. The system helps to automate the process of gathering information and obtaining results. The subject area is analysed, various information systems based on a particular principle are considered. A description of the system requirements according to the RUP methodology is given, a detailed description of the main functions of the system, an algorithm of operation, and side effects. The necessary software environment description in which the information system is developed is made and the implementation of the software. The information system meets all modern requirements and allows users to analyse the text and formulate the necessary conclusions.

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