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Influence of algorithmization and interface for the preparation of management decisions*

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Abstract

In modern conditions, managerial decision-making is carried out using automated systems under the general name "Decision Support Systems" (DSS). When creating them, it is important to consider two key points. The first is the algorithmic component, which reflects the logic of the system as a whole and its individual parts. The second is the application interface through which the user interacts with it. The interface is a graphical interpretation of the algorithms that are implemented within the system. Therefore, it is very important to design and create such a relationship between the algorithm and the interface so that the user is as comfortable as possible using the DSS to solve current tasks (information input, its processing, presentation and analysis for decision making). Thus, there is a directly proportional relationship between the interface and the algorithm. Moreover, despite the fact that there are many studies on these aspects, both theoretical and practical, there are

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still questions to which one should pay attention to in terms of application. The purpose of this study is to formulate practical recommendations to prevent the entry of incorrect information into the DSS database and to present the results in a form convenient for its analysis. The main tasks of the work are to show by means of examples which errors can contribute to the entry of unreliable information into the database, as well as how best to present information on the monitor screen in accordance with the psychophysiological characteristics of a person in order to reduce the time for its analysis and decision-making.

Keywords: decision support systems, features of algorithmization, interrelation of the interface and algorithms, presentation of information, error handling when entering information

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Introduction

Key indicators in making managerial decisions are that they are reasonable and timely. This can only be achieved by using relevant information that meets all of its classical requirements: reliability, consistency, completeness, relevance, value, understandability, accessibility, etc.

Therefore, on the one hand, it is very important to algorithmically track and eliminate all potential errors at the stage of initial input of information into the database, since subsequent processing of incorrect information will inevitably generate incorrect results. Their analysis, in turn, will lead to wrong conclusions in decision making.

On the other hand, the aspect of presenting information for analysis and decision-making is no less important. And this depends on the features of the interface, through which the visual interpretation of the results of processing information intended for decision making is carried out.

Algorithmization and interface are very multifaceted areas. In the article, attention is paid only to certain points related to some applied issues, the knowledge of which will allow decision makers (DM) to take them into account when formulating tasks for the preparation of analytical information, as well as to reduce the time for its analysis in the future.

The presentation of materials on the subject of managerial decision-making can be considered in two interrelated aspects. The first aspect is related to issues of an organizational and methodological nature (in particular, the mathematical apparatus used, the features of the application of system analysis, organizational interaction between interested levels of management). The second aspect is specialized software, i.e. the decision support system (DSS) focused on the processing of information for analysis and decision making. Currently, they are based on applications in the form of expert systems and artificial intelligence [1]. In addition, such canonical forms of analytical content as tables (formed according to certain rules) and graphs remain in demand. They may reflect: the results of information processing within the framework of expert systems or artificial intelligence systems, business intelligence systems or any other calculations performed in the conditions of any specialized systems.

1. About the role of information in the decision-making process

Kravchenko and Isaev give 13 stages in the decision-making process [2, p. 21–26]. The first stage consists in the awareness of the decision maker of the need to make a decision (non-formalizable part). The second and third stages ("Obtaining information" and "Analysis of information", respectively), from which, in fact, the process itself begins, are associated with the information aspect. The subsequent stages define the classical actions in the course of system analysis, allowing one to come to the choice of a solution.

Speaking about the use of a computer in solving applied problems in [3, p. 17], it is noted that among the relevant software (software) for the subject area "Economic activity" there are accounting programs, programs for calculating estimates, evaluating the effectiveness of investment projects, real estate valuation, etc. In addition, the spreadsheet MS Excel can be used quite effectively.

In [4] it is indicated that the term "Management Decision" (DM) "... is used in two main meanings – as a process and as a phenomenon. As an SD process, there are the following basic procedures: information preparation, development of options, coordination of options, choice of one option, approval, implementation, control over the implementation of SD and informing the initiator of the decision. As a phenomenon of SD, there is a set of measures aimed at resolving the economic problem under consideration in the form of a resolution, order or instruction given orally or in writing" [4, p. 22].

In [5], there is a special section devoted to information support for decision-making, where information for the designated purposes is presented as a key factor in the context of its canonical features, including its modern interpretations in the Internet format.

Tabekin notes that one of the factors determining the quality of management decisions is "... the volume and value of the information available; for the successful adoption of a managerial decision, the main thing is not so much the amount of information as its value (relevance) and timeliness, combined with the level of professionalism, experience, intuition of personnel making and implementing a managerial decision ..." [6, p. 36].

Krushanov draws attention to the fact that "... early cybernetics was characterized by two diverse controversial tasks ...", the first of which was that generalized control processes and the phenomenon of information were singled out as new subjects of scientific knowledge. This is designated as the management-informational aspect of cybernetics. The author understands management as "... purposeful information impact, carried out according to the feedback scheme" [7].

From the above definitions, we can conclude that information is the "main character" in solving problems related to analysis and management decisions.

The decision-making process itself is based on the following key points:

1. Information provided in a timely manner, presented in a correct and easy-to-understand form.
2. Mathematical tools that allow you to process the original information in order to interpret it for decision making.
3. Software for automated processing of initial information according to the applied algorithms.
4. Non-formalizable aspects that depend, for example, on the intuition of decision makers, on their competence in interpreting special information depending on the final or intermediate goals of the analysis.

2. Impact of errors when entering information into the database to its subsequent processing for decision-making

Using the example of *Table 1*, we will comment on some types of algorithmic errors that may occur during the initial formation of the Database (DB) and subsequently provoke the appearance of incorrect results in order to process information for analysis and decision making.

Table 1.

Types and examples of errors (based on [8, pp. 38–39])

View errors	Error example	Comment
1. Errors in data recording	1. Recorded 5 instead of 4. 2. Instead of code 36, denoting enterprise "A", code 35 was introduced.	These are random "manual" errors. It is very difficult to identify them. It is possible only by chance or in the context of subsequent decisions, in which incorrectly entered information will affect the results and attract the attention of the analyst. The second error is possible even if the code (or company name) is selected from the drop-down list.
2. Not installed data	A payment was received from the buyer under No. 153, but the buyer with this number was not found in the list of accounts payable.	This type of error can occur for two reasons. First: since the payment is generated "on the side" and there is no way to check the correctness of its filing, then it will not be possible to enter information from it into the database. If the document is critically important and its contents cannot be ignored, then there is only one way out: through communication channels, contact the source of information and clarify the issue "manually." Second: the list of accounts payable was formed incorrectly. Solutions: 1) reshape the list; 2) check the list generation algorithm; 3) check the database (perhaps the mistake in the account number was "manual").
3. Distortion of the regulated limit.	For certain types of deliveries for buyers, there are restrictions on the quantity of the corresponding product within one purchase (for example, 100 products). But if a manager has issued two orders to one buyer (for example, 75 items each), the total volume of which exceeds the established norm, then this buyer will be able to receive a quantity of goods that exceeds the established limit value.	Incorrect algorithm. When trying to issue a second order for more than 100 items, the system should either prompt the clerk to issue an order for 25 items, or block his actions when trying to issue a second order for 75 items and inform the user about this.
4. Missed entries	The entry in the database was deleted for some reason.	Such an error may be the cause of error #2. Actions related to the removal of certain information should be a lgorithmically strictly regulated. For example, apply the question "Are you sure you want to delete?". Or deleted information may be in the "recycle bin" for some time with the possibility of restoring it if necessary.
5. Errors when generating reports	The decision maker, when analyzing the report, assumes that it includes information on sold and paid products. However, in fact, in addition to paid goods, the document contains goods sold on credit.	Similar errors can occur quite often due to an incorrect description of the task for programming. For the formation of reporting (analytical, statistical) documents, it is advisable to always offer their graphic structure with the correct names of the columns, and, if possible, it is necessary to determine the details of the database, which are the basis for compiling the document.

View errors	Error example	Comment
6. Data Entry Errors	For some reason, the increase in wages for an employee with personnel number 174 is recorded in the database for an employee with personnel number 175.	On the one hand, such an error can be "manual". On the other hand, deliberate. In any case, if the employee knows about the increase in salary, then the first time after the increase, the error will be revealed. If the employee is not notified of the salary increase, then the situation relates to the moral and ethical sphere.
7. Repeated mistake	An incorrect price for a product has been entered into the database, therefore products of this type are billed for payment at this incorrect price.	The error could be "manual" or intentional. Since the source for entering this kind of information is usually a paper document, its scanned copy can always be saved for some time in special folders or files. Periodically, you can perform "manual" checks. Knowing this, the employee is unlikely to take risks.
8. Incorrect differen-tiation by periods	Information about the order was entered into the database on the last day of the month. But the actual shipment of goods under this order was carried out only a few days later in the next month. However, information about the sale is reflected in the database for the previous month.	The reason for the error is an incorrect algorithm. This is a typical example of ignoring exception handling. The decision should be based on compliance with the conditions specified by the potential user.
9. Data falsification	An employee of the organization, who has access to the financial information of other employees and has the rights to change information, deleted records of unpaid invoices of his colleague, which provided the latter with the opportunity not to pay for purchased goods and (or) services.	The reason for the error is the incorrect differentiation of access rights for an employee when working with information. Removing information is always a critical aspect. Therefore, all actions related to removal are subject to strict regulation and control. This can be done algorithmically through a procedure for logging (journaling) jobs.
10. Incorrect accounting	Money that was given to the buyer's representative for one purpose was spent on completely different purposes (for example, instead of paying for tools for work, a business dinner at a restaurant was paid for).	These errors can be detected either by chance, or by the results of the analysis of reporting documents, or during the audit. Since the source for entering this kind of information is probably a paper document, it is always possible to determine a logical relationship between its details. And when filling out the corresponding form on the screen, algorithmically reveal such a connection. If a recognition procedure is used to enter information from a document, then a special algorithm can also be applied that determines the correlation between logically related attributes.

The examples of errors given in the table refer to the subject area "Accounting". However, it is not difficult to project them to any other subject areas.

3. Algorithmic features of the interface

More than 20 years ago, Nielsen proposed 10 basic principles that must be considered when designing user interaction with a system [9]. These principles are universal in nature. They can be considered classic, so they have not lost their significance at the present time. Ignoring these principles can provoke various kinds of problems when using various types of automated information systems, including decision support systems.

Let us briefly comment on the principles that should be reflected in the algorithmic context and that a potential user can take into account when formulating functional requirements for decision support systems.

Principle 1: Visibility of the state of the system. The duration of the solution of essentially different tasks may be different. There are tasks, the solution of which is carried out so quickly that, at the current speed of information processing on modern computers, the result is issued almost instantly after pressing the Enter key. However, there are other tasks (for example, drawing up production plans, calculating some indicators for a large number of employees, processing significant amounts of statistical information to make forecast estimates, etc.), the solutions of which can be quite lengthy. In this case, it is useful for the user responsible for completing the task to provide visual information about its chronology. This information can be either discrete or continuous. You can use a horizontal indicator, circular indicators (hours or sectoral filling), or some other.

Principle 2: Correspondence between the system and the real world. It should always be remembered that the DSS is intended for use in a specific subject area in which specific terminology is necessarily present. Therefore, all information presented to the user on the monitor screen must fully comply with those semantic meanings (concepts, definitions, designations, names of objects, indicators, coefficients, processes, situations, phenomena, dependencies, etc.) that are accepted in this area. The interface should not contain terminology typical for the IT field, with the exception of procedures and actions that have become "de facto" standards (copy, print, cut, save, etc.), provided that their terminological replacement is inappropriate. In all other cases, it is always necessary to find an analogy between the terminology of the IT sphere and the subject area. For example, the interface should not contain the word "Database," since in reality it may correspond to the "Chart of Accounts," "Personal Files of Employees," "Production Equipment," "Payment Schedule," etc.

Principle 3: User control and freedom. The user should not be afraid to make a mistake. The system should always "insure" him. It could be:

- a warning message (for example, "Are you sure you want to delete the entry about the employee with personnel number ...?," "After changing the indicator "Ω," it will be impossible to restore its initial value," "Check the time synchronization with the Internet," "You did not specify the calculated period," "The accuracy of calculations should not exceed 2 decimal places");
- context prompt when entering information (for example, "Attribute value must not exceed 10 characters," "Enter only numeric data");
- the ability to select a value from a drop-down list when filling in a field (using the necessary directories, dictionaries, classifiers and other ordered sets of certain objects), which significantly reduces the likelihood of entering an incorrect value (in the DSS, this can be used to make a request for obtaining the necessary information);
- the ability to return to previous stages of processing.

Principle 4: Consistency and standards. Within the framework of one system, all used names of objects (processes, phenomena, situations, etc.) must be unified. For these purposes, in particular, classifiers, reference books, dictionaries are created, which are usually referred to as reference information. Ordered sets of corresponding values make it possible to save

time when entering information, minimizing errors, optimizing the amount of computer memory when storing the entered data, and unifying the required information in all documents reflecting any kind of analytics (*Fig. 1*).

Technologically, the use of values from classifiers or their analogues is carried out through drop-down lists.

Principle 5: Prevention of errors. A well-designed interface should either prevent the user from making mistakes altogether, or minimize their occurrence. When entering information, this can be done, for example, by context prompts, selecting values from the proposed lists, using masks or templates. For data of the type "year" (when entering a value manually), it is advisable to specify an additional range of change, since an incorrectly entered value may be "outside" the allowable historical period.

To indicate dates and (or) time periods, as a rule, modern tools are used that allow you to almost completely eliminate the error when choosing dates. The date in the "DD.MM.YYYY" format can be selected either from the built-in calendar, or "assembled" from parts (day, month, year) – from sequences of logically reasonable proposed numbers. The user only needs to specify the desired values. The error in this case may be accidental due to inattention.

It is enough to simply detect an error in the boolean type indicator (i.e., it can take one of two values – "0" or "1").

In any case, "manual" input, especially for text and (or) character information, should be kept to a minimum.

Principle 6: Recognition, not recollection. The user should feel comfortable and safe when working with the interface. Therefore, he needs to create conditions that will not require him to remember the exact sequence of any of his actions when performing certain tasks. He must always be sure that the system will either prompt him with a simple logical way out when he makes a mistake, or provide a link to the appropriate fragment of the instructions for working with the application.

Principle 7: Flexibility and efficiency of use. In any decision support system, there may always be settings that the user can customize to his individual preferences if he uses the relevant information to solve only his current tasks. For example, in the 1C:Enterprise system, there are 76 (!) interface objects for which the user can independently change their color scheme according to their requirements [10]. If the information (in particular, the generated report) is transferred to the external part of the system in which settlements are carried out, or to a system located outside the perimeter of the relevant organization, then it must comply with accepted corporate standards.

The remaining three principles ("Aesthetic and minimalistic design," "Helping users to recognize, diagnose and correct errors" and "Help and documen-

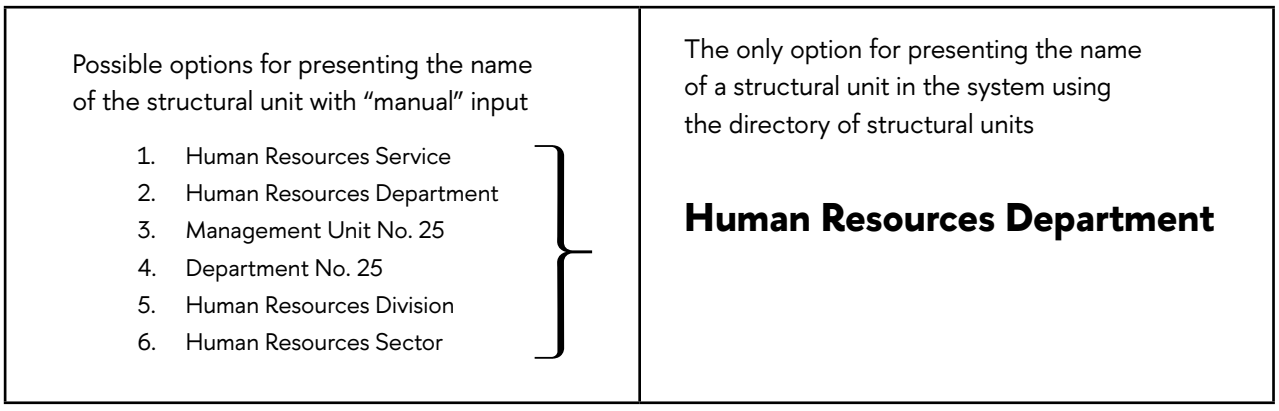

Fig. 1. Illustration for unification of the name of the management unit in the enterprise (in the organization).

tation") are not directly related to algorithmization and therefore do not affect the formulation of user functional requirements. Professional application developers should implement these principles "by definition."

4. Features of the use of text and symbolic information in the interface

Information intended for analysis must meet certain requirements. This is explained by the fact that working in a virtual environment should not create discomfort due to the psychophysiological characteristics of a person.

The interface, being a virtual environment from the user's point of view, should not contradict his actions in the real world. This is due to the general principles of human mental activity (in the broad sense), as well as to the peculiarities of information perception through the senses. Weinshank reflects such aspects in [11].

As an example, consider the impact of different fonts and markers that can be used to represent insights.

There is a very wide variety of fonts. More than 80 types are presented on the resource [12].

Here are some recommendations for using some fonts [13]:

1. Serif fonts (the most popular – Times New Roman) have a universal purpose and can be used for a wide variety of text. But it is especially important that they represent the text well even when using a small font size and are therefore suitable for displaying a large amount of text.
2. Sans-serif or sans-serif fonts (examples: Arial, Tahoma, Verdana) and monospaced fonts (example: Courier New) are recommended for headings or selections of text, but not for text as a whole.
3. Fonts stylized as handwriting make it difficult to read large texts. Therefore, they are recommended as headings or highlighting fragments of text.
4. Decorative (for example, Gothic or Old Slavonic) should be used with extreme caution, as they do not correspond to the present and therefore can be perceived with difficulty.
5. An outline font, a font with a shadow, as well as underlined text are not recommended for large text fragments, as this makes it difficult to read (the clarity of the text is lost, which complicates its perception and understanding).
6. There is such a thing as "reverse," when, for example, white letters are located on a black background. Using this technique for long text presented in small print is also not very comfortable and will make it difficult to read. However, this technique can be used for headers.

There are special free resources on the Internet for converting text to any font, for example, [14, 15].

The provision of public information, especially within the framework of functional software (SW), must comply with the general rules for its perception. As an example, we present the text located at the link [16] (*Fig. 2*). On *Fig. 3* the same text is transformed into a form convenient for perception and understanding. This was done by structuring information, i.e. splitting the text into fragments and highlighting the same type of semantic meanings in the form of lists. The difference in the presentation of the same information is obvious.

As markers for lists, it is recommended to use symbols filled inside (for example: ■ ● ♦ ◆ –), i.e. contrasting in relation to the text, since their style is fundamentally different from letters, and the essence of the marker is precisely to highlight the elements of the list. In contrast to this, it is not recommended to use symbols that are "empty" inside for the same purposes, since in their outline they resemble letters (for example: ❖ ☐ ❑ ❒ ☒ ☐ ○), although they are not. However, the clarity of the lists in this case will be "blurred."

Equally important is the use of icons and pictures. You can either draw your original ones, or choose only those that are presented on special free resources. You cannot copy ready-made drawings, pictures, icons, logos or their fragments if they are copyrighted. Otherwise, it will be contrary to the Law of the Russian Federation "On Trademarks, Service Marks and Appellations of Origin."

Program description:
"Orakl–Kadry" («ORAKUL – Kadry Frames»)

"HR document management and personnel management system" is the most powerful personnel program under Microsoft Windows 95/98/NT4/2000/ME/XP, covering all aspects of personnel records and document management. The program was created with the help of leading HR managers in St. Petersburg and has been popular for over 3.5 years. The program will take over everything that you previously had to do manually, sorting through the "mass of paper." "Orakl-K" is distinguished by simplicity and ease of management; it is universal and easy to use for any computer user, both experienced and novice. The "standard version" includes: a password at the entrance, 4 databases (regular, personnel reserve, dismissed, archive) with employee registration cards (more than 130 topics & windows!), maintaining all records (timesheets, vacations, business trips, sick leave, loans, mat .help, compensation, etc.), a huge library of personnel template documents, automatic creation of orders, customizable staffing (of any complexity!), Your personal notes, all military records, experience, analysis block, more than 33 thousand (!!!) sample-reports (i.e. finding any information).

Fig. 2. Example of "unreadable" text (fragment) [16].

Description of the program: "Orakl–Kadry" ("ORAKUL–Kadry")

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The "standard version" includes:

- password at the entrance, 4 databases (regular, personnel reserve, dismissed, archive) with employee registration cards (more than 130 topics & windows!);
- maintaining all accounting (time sheets, vacations, business trips, sick leave, loans, financial assistance, compensation, etc.);
- a huge library of HR document templates;
- automatic creation of orders;
- customizable staffing (of any complexity!);
- Your personal notes;
- all military records;
- seniority;
- block of analysis;
- more than 33 thousand (!!!) sample-reports (i.e., finding any information);
- blocks of testing and certification and much, much more.

Both standard delivery and complete set under your specific order are possible. The program takes into account the requirements of the Decree of the Government of the Russian Federation and the corresponding Decree of the State Statistics Committee. For non-standard solutions, an additional 35 standard expansion modules or custom-made functions are available.

Fig. 3. Converted text example (fragment).

5. Features of presenting information for analysis and decision-making

Since the quality of decision-making is directly dependent on the information used, it is very important to visualize it in a certain form. On the one hand, it should really contain only those indicators (dependencies, calculation results, statistics, etc.) that are necessary for analysis and management decision-making in specific situations. On the other hand, the presentation of information should be so clear that the time spent on its consideration is minimal, no matter how quickly the decision needs to be made.

The scenario of the dialogue within the framework of the DSS may include the indication of some operational conditions for the selection of information and its processing. These include, for example:

- period of time (from ... to ...);
- structural subdivision (production or management of any level);
- a group of goods or services;
- sales market (district, city, region, country);
- price or value characteristics;
- method of delivery of goods;
- ordering in ascending or descending order of indicators;
- summing up intermediate and (or) final results;
- marking results that go beyond the established limits (up or down) or have deviations that exceed the regulated limits.
- etc.

The dialogue scenario may also provide for the need and (or) variability of a subsequent decision, depending on the intermediate results obtained either at a certain stage of the decision, or before a regulated point in time.

As it is known, any resulting information for analysis can be obtained in two ways. First: document structures are known and therefore the algorithm for their formation is pre-programmed. In this case, it is enough for the decision maker to select the desired document name (in the broad sense, since in addition to the traditional table, the document can be presented, for example, in the form of a graph, "flat" text or an animated "picture") from the proposed list. Second: the structure of the document form is set by the user himself immediately before the formation of the desired document. To do this, the user must have the skills to compose a request for the selection of information (i.e., to know the special query language provided for in a particular DSS), which allows one, without special programming, to quickly generate any form of documents at the request of the user himself.

In tabular documents intended for analysis, there should be no "information noise" which does not carry any semantic load but on a subconscious level distracts the user's attention and slows down his work. An example is shown in *Fig. 4*.

The option of getting rid of this kind of "information noise," which makes it difficult to perceive information, is quite simple. For the given table, you need to add in the name of the corresponding column, separated by a "comma," the value (in the example, this is the unit of measurement), which is repetitive (*Fig. 5*).

Computer technologies make it possible to single out separate fragments of analytical documents in a special way which helps to attract the attention of analysts. For these purposes, you can use, for example, changing the font (by style, color, size), "painting" or framing certain cells (rows, columns) of the table, as well as other features. It is advisable to use such a "design" in order to show values that are significantly different from others, a change in some indicators by a critically permissible value, an indicator value approaching a regulated limit, etc.

In some cases, color coding may be used. This will be useful, for example, in the case when one analytical document simultaneously needs to reflect the different statuses of objects and (or) their characteristics. Thus, within the framework of one document, in particular, goods can be noted: awaiting shipment, shipped, awaiting payment, paid.

When designing tables, one feature must be taken into account. If it turns out that in one of the columns

Year Result: 2022 Smartphone shipments						
Rank	OEM	Y2022		Y2021		YoY
		Shipment	M/S	Shipment	M/S	
1	Samsung	259	21%	272	20%	-4.8%
2	Apple	231	19%	235	18%	-1.3%
3	Xiaomi	152	13%	190	14%	-20.0%
4	Oppo Group	107	9%	144	11%	-25.6%
5	vivo	98	8%	134	10%	-27.1%
6	Transsion	68	6%	75	6%	-8.7%

Fig. 4. An example of an analytical document (excerpt) containing "information noise" [17].

Year Result: 2022 Smartphone shipments						
Rank	OEM	Y2022		Y2021		YoY, %
		Shipment	M/S, %	Shipment	M/S, %	
1	Samsung	259	21	272	20	-4.8
2	Apple	231	19	235	18	-1.3
3	Xiaomi	152	13	190	14	-20.0
4	Oppo Group	107	9	144	11	-25.6
5	vivo	98	8	134	10	-27.1
6	Transsion	68	6	75	6	-8.7

Fig. 5. Sample policy paper (detail) without "information noise."

in all lines there is the same value (textual, digital, logical, "date" or some other), then this contradicts one of the properties of information – informativeness. In such cases, it is advisable to reflect the name of such a column in the heading of the table and exclude this column from the structure of the table. The table will become more compact and easy to analyze.

It is known that in some cases, for analytical information, a graphical form will be more preferable and visual. It can exist as the only option for presenting relevant information or as an addition to the classic table. A good example of analytics and statistics are the static yearbooks published by the Higher School of Economics. On *Fig. 6* and *7* such examples are shown.

Conclusion

The subject, reflecting theoretical and practical aspects in the field of DSS, is of interest to different groups of specialists. The main part of the publications is devoted to general issues of a canonical nature in this subject area, for example [20], the use of spe-

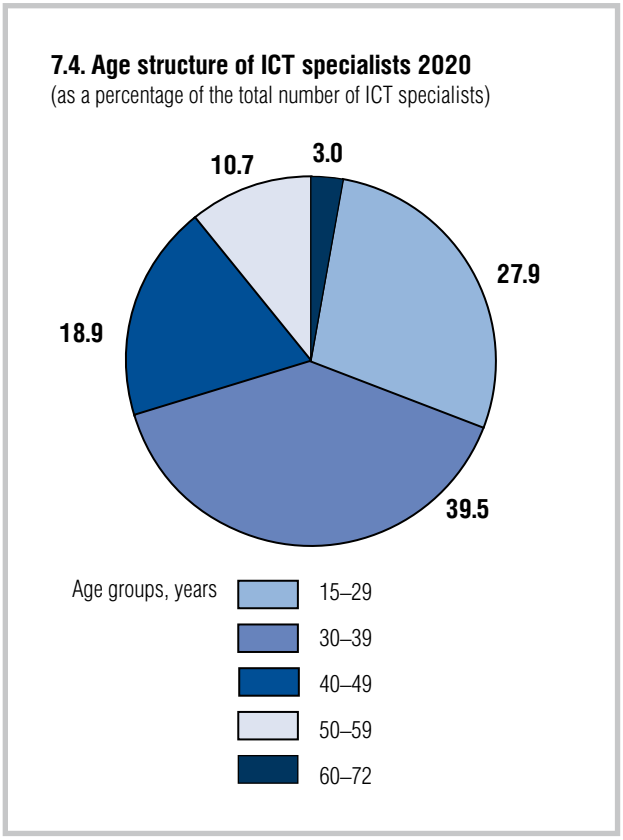

Fig. 6. Example 1 of graphical representation of analytical information [18, p. 80].

cific methods and models, a description of the application and related features of DSS in various functional areas (medicine [21–23], specialized universities [24], defense technology [25], coal preparation enterprises [26], forestry [27–28], transport [29], financial issues [30–31], etc.), as well as a description of the DSS used in the form of specific software.

Nevertheless, insufficient attention is paid to applied issues that must be taken into account both when formulating functional requirements and evaluating DSS by potential users, and when designing and developing systems of this kind by developers. This article deals with certain issues in these aspects.

Decision support algorithms and the accompanying interface are dynamic and evolving areas that include many nuances that are often overlooked by users and developers. This is what can create problems in the application of various information systems, including DSS. Therefore, the issues discussed in the article concerning the algorithmization and interface can be considered with varying degrees of depth and differentiation, as well as a critical analysis of DSS present on the market, which may be the subject of further research.

The materials of this article may be useful to specialists who act as decision makers. They can use them when formulating functional requirements for the development of DSS on order, as well as when evaluating the interface of already existing systems acquired by an enterprise or organization to solve their tasks of supporting managerial decision-making.

The information presented in the article can also be applied in the applied aspect by students, undergraduates and graduate students who are engaged in research in the field of managerial decision-making and (or) the creation of a DSS.

Certain points outlined in the article may be of interest to DSS developers. ■

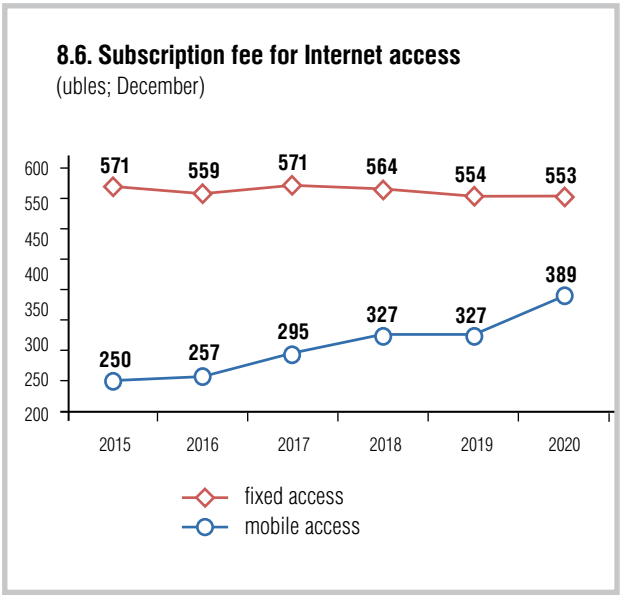

Fig. 7. Example 2 of graphical representation of analytical information [18, p. 93].

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