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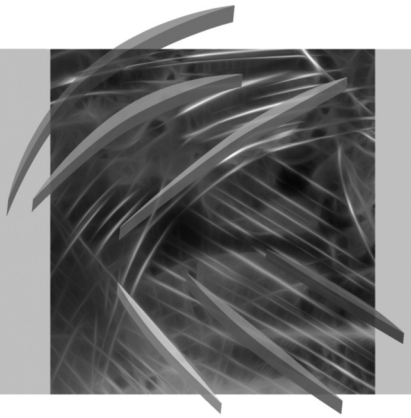

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Intelligent Technologies and Applications

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RESEARCH ON USABILITY OF VISUALIZATION IN SEARCHING ECONOMIC INFORMATION IN TOPIC MAPS BASED APPLICATION FOR RETURN ON INVESTMENT INDICATOR

Abstract: In business environment, where quick and reliable access to knowledge is crucial factor of success, efficient processing of data and information resulting in acquiring new knowledge concerning enterprise becomes essential. Research on using topic maps standard for the representation of knowledge about economic measures is conducted. Used visualization of the semantic network in topic map can provide valuable assistance for the economic data analysis and decision making tasks. The paper reports the results of an end-user study, which assessed the usability of visualizing semantic network based on topic maps to search information in application for return on investment (ROI) indicator. To achieve this goal, the usability testing technique and heuristic evaluation of user interface were used.

Keywords: ontology of economic indicators, information visualization, evaluation of usability of visualizing in searching information, return on investment indicator, topic map.

1. Introduction

More and more attention is paid to the use of semantic technologies such as topic maps (TM) as a solution which can be used to search and acquire unique information [Wurzer, Smolnik 2008]. Topic map standard [ISO/IEC 13250:2000] enables the representation of complex structures of knowledge bases [Arndt, Graubitz, Jacob 2008], and the delivery of a useful model of knowledge representation (see [Librelotto et al. 2009, p. 174]), where multiple contextual indexing can be used. TM is a relatively new form of presentation of knowledge, which put emphasis on data semantics and ease of finding desired information (see also [Ahmed, Moore 2006; Pimentel, Suárez, Caparrini 2009, p. 30]). These characteristics of TM resulted in conducting research on using topic maps for presenting knowledge of economic ratios and semantic associations existing between them (see [Dudycz 2011a]). Economic ratios provide the information about financial results achieved by an enterprise. Be-

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tween them there are various relationships. However, the usefulness of economic ratios in decision-making depends on accurate understanding by managers of both logic of counting of these indicators and semantic relations between them.

The topic maps standard provides different ways to show various connections (including semantic) between economic indicators and enables to semantically search information. It is very essential, because semantic search is more efficient than that based on basic hierarchic structure (see [Garshol 2004; Yi 2008, p. 1899]). Furthermore, latest research points out also that searching information basing on semantic connections in topic map has positive influence on discovering essential information (see [Won, Oh 2008, p. 301]).

In the semantic search in topic maps the visualization of relations between topics plays important role. Graphical expressions could assure semantic information search and interpretation for non-technically-minded users. Therefore, one of the most pressing questions about visualization-based information retrieval systems is: "Can people use them?" (see [Koshman 2005, p. 824]). It is very important, because how decision makers perceive and interact with a visual representation can strongly influence their understanding of the data as well as the usefulness of the visual presentation (see [Jain, Kasana, Jain 2009, p. 48]).

In order to verify the usability of the visualization of the semantic network in performing tasks connected with searching information on economical ratios, the research with participation of users was carried out. In the research the usability testing technique and heuristic evaluation of user interface[1] were used. In this research, the usability of the visualization of the semantic network on account of quantitative data[2] was assessed. In addition, we paid attention to carrying out an analysis of results concerning the following research question: does knowledge and experience of user in given field have influence on easiness and speed of obtaining needed information, basing on visualization of semantic network? The article is structured as follows. In the next section the visualization as an interactive interface is presented. In Section 3 assumptions and course of conducted research is briefly described. In Section 4 the analysis of results and conclusions are presented. Finally, in the last section a summary of this work is given andfuture research projects are indicated.

2. Visualization as interactive interface – related work

Visualization is the interactive, graphical rendering of abstract data to enhance information retrieval. The use of visualization techniques can help to solve the problem,

[1] Independent research, conducted by R. Jeffries, J.R. Miller, C. Wharton and K.M. Uyeda has indeed confirmed that heuristic evaluation is a very efficient usability engineering method [Nielsen 2005].

[2] Quantitative data are typically measures of task performance, e.g., the accuracy of executing of a specific task (number of mistakes) (see [Jain, Kasana, Jain 2009, pp. 50–51]).

because "visualization offers a link between the human eye and the computer, helping to identify patterns and to extract insights from large amounts of information" (see [Zhu, Chen 2005, p. 139]). In the visualization human factors (e.g. interaction, cognition, perception) play a key role in the communication between a human and computer and therefore contribute significantly to the visualization process (see [Jain, Kasana, Jain 2009, p. 50]). During the studies on the usability of the visualization in searching information it is necessary to take into account also human factors. B. Shneiderman defined five measures essential in studying the system usability: system familiarity time, task performance speed, errors in task assignments, system feature retention, and subjective satisfaction [Shneiderman 1998].

Systems that enable information retrieval should be intuitive to use or easy to interpret by users of the system. A good interface of the information visualization contains a good representation (helps users identify interesting sources) and efficient navigation (allows users to access information quickly) [Hunting, Park 2002]. The basic assumption of navigation is that users should be able to view focus and context areas at the same time to present an overview of the whole knowledge structure [Smolnik, Erdmann 2003]. B. Shneidermann defined three stages of visualization process (which has been called "B. Shneidermann's Visual Information Seeking Mantra"), which allows to retrieve needed information (see [Keim 2002, pp. 100, 101; Keim, Schneidewind 2005, p. 1768]):

1. Interactively by overview – the user needs to get an overview of the data and identifies interesting patterns.

2. Zoom and filter – the user focuses on one or more of interesting patterns.

3. Details-on-demand – the user needs to drill-down and access details of the data for analysing the patterns.

D.A. Keim, F. Mansmann, J. Schneidewind and H. Ziegler modified these three stages of the visualization, by adding another one. These are following stages:[3] (1) analyse first, (2) show the important, (3) zoom, filter, and analyze further, (4) details-on-demand (see [Keim et al. 2006, p. 15]). In this interactive visual process, the user is able to subsequently concentrate on the interesting data elements by filtering uninteresting data, and focusing (zooming in) on the interesting elements, until final details are available for an interesting subset of the analyzed elements (see also [Atzmueller, Puppe 2005, p. 1756]). Therefore, a visualization tool should allow the user to adapt queries in an interactive way by dynamically mapping the underlying data and the resulting graphs in real time and should also enable scalability [Kroeze et al. 2008].

One of visualization methods enabling visual information searching is a topic map standard. TM contains a spatial element and is therefore suitable for graphical visualization [Kroeze et al. 2008]. Topic maps – as a visual interactive interface –

[3] Named by D.A. Keim, F. Mansmann, J. Schneidewind and H. Ziegler as "visual analytics mantra" [Keim et al. 2006].

allow to display the whole semantic network (topics and associations) efficiently, as it is essential to select the relevant information. Fundamental factors for a good visualization interface of the application of the topic map are: the overview of the structure for the global understanding of the structure and of the relationships within the hierarchy; the ability to zoom and to select some nodes; and dynamic requests in order to filter data in real time [Grand, Soto 2000]. Thanks to the visualization users can more swiftly notice and understand various structural and semantic relations.

3. Usability of visualization in searching economic information in topic maps – research design

3.1. Conceptualization of ontology of ROI indicator

In order to study usability of visualization in searching economic information in topic map application for ROI indicator was built. It required identifying all terms, defining the classes and the class hierarchy, modelling of associations and indicating occurrence. According to proposed procedure of creating an ontology for economic ratios,[4] tacit experts' knowledge concerning Du Pont model was achieved. These works resulted in creating the ontology of ROI indicator, which was possible to represent in topic map standard (widely described in [Dudycz 2010a, b]). During building it there were no ontology or topic maps that could have been used.

3.2. Creating topic map application for ROI indicator

Theontology of ROI indicator was represented in the topic map standard in the tool TM4L, which allows also visualizing topics and relations between them. Initial research verifying the implemented ontology of ROI indicator was carried out and application was modified (see [Dudycz 2010b]).

Further research verifying the use of a topic map in economic analysis of indicators required participation of more users. As it turned out, the application created in TM4L does not work correctly on operating system MS Windows. Owing to that difficulties with carrying out further studies, which aim at verifying the usability of applying the visualization of a semantic network in contextual search, occurred. Finally, it was decided to represent the ontology in program Protégé, because both this tool and created application work well on operating system MS Windows 7.

3.3. Assumptions of the research

The aim of the research is inter alia to verify the usability of applying the topic map standard as a visual interface supporting contextual search in the analysis of eco-

[4] The procedure was presented in [Dudycz 2010a].

nomic ratios. It was decided to carry out a research with the participation of users.[5] Their selection was not random, as they were to fulfil double role. First role was to be a typical user, performing specific tasks in a topic map application for ROI indicator (research using usability testing technique). Second role was to be an expert evaluating the usability of applied interface (research using heuristic evaluation of user interface). That is why people who attended lectures in subject "Human–Computer Interaction" and graduated with a bachelor's degree participated in the research.

The study was conducted on two created ontologies for different areas: field of study and economic ratios. Firstly participants of the research accomplished seven tasks, consisting in searching information in the semantic network build for faculty "Business Informatics". Then the participants carried out seven tasks in semantic network for ROI indicator. For both applications they performed expert opinion of the usability of applied interface according to identical criteria.

The selection of the participants of the research allowed obtaining a group of people, who ought to know used names of terms and relations in application for ontology "Business Informatics". However, in case of second application we deal with people, who have various experience and knowledge concerning economy and analysis of economic ratios as well as systems and information technology. Participants in the research were divided into three groups: with only computer education, computer science and econometrics education and non-computer education.[6]

The research was carried out according to the following plan:[7]

1. Preparation of the questionnaire evaluating the usability of applying the visualization in contextual searching:
   a) ontology of faculty "Business Informatics",
   b) ontology of ROI indicator.
2. User-based study:
   a) introduction to the study (short training),
   b) usability test:
   – task-based user test for ontology of faculty "Business Informatics",
   – task-based user test for ontology of ROI indicator.
3. Data analysis.
4. Discussion of results.
5. Conclusions.

[5] In literature many methods of research and evaluation of human–computer interaction are described (see inter alia [Sikorski 2010]). The research of a prototype is conducted with the experts' participation (e.g. heuristic evaluation of user interface) and/or users (e.g. user testing, usability testing, eye tracking).

[6] In this group 80% of the participants have economic education.

[7] The plan of the research is a modification of the research methodology used by M. Sikorski to evaluate the usability of on-line service (see inter alia [Sikorski, Garnik 2010]).

The research was conducted on two applications created in the program Protégé 4.1 beta.

3.4. Course of research

Two questionnaires, which consisted of three parts, were worked out.[8] They differed from each other only in the first fragment, in which tasks to be done by a user, consisting in searching information or saving to file specific fragment of ontology, were formulated. In the study 42 people participated: with only computer education (48% of all the participants), computer science and econometrics education (21% of all the participants) and non-computer education (31% of all participants). None of them either searched information basing on the visualization of ontology before or was familiar with the program Protégé. Performing tasks by the users was preceded with an introduction (15 to 25 minutes, depending on the group), in which it was shown: how to open the application with an ontology in the program Protégé, how to save the chosen fragment of the graph as a graphic file or as a graph, and what was the idea of semantic search and topic map standard. The training was restricted to minimum, because the research was also to tell how easy and clear is searching information with the use of the visualization of the semantic network, for a user who is not familiar with the topic map application.

4. Analysis of results and conclusions

4.1. Analysis of tasks accomplishment by research participants

The results of the study may be divided into two groups. The first group results from the research using the usability testing technique. It concerns the correctness of performing tasks by users and the assessment of easiness of searching information basing on the visualization of the semantic network. These are the data obtained from the first part of the questionnaire. The second part of the results comes from the research using the heuristic evaluation of user interface. These are the data obtained from the second and third parts of the questionnaire. In this article we will analyze the data acquired from the first group, in the context of the verification of the hypothesis that knowledge and experience of a user in given field has the influence on the easiness and speed of obtaining needed information, basing on the visualization of the semantic network.

The first part of the questionnaire contains a task list to be accomplished, and a form in which research participations assessed easiness of information retrieval using the visualization of the semantic network. In this paragraph we will analyze the

[8] Tests for the ontology for the faculty "Business Informatics" are thoroughly described in [Dudycz, Korczak 2011], whereas for ROI indicator in [Dudycz 2011b].

correctness of performing tasks by users, and in the next paragraph – assessing the easiness of a task accomplishment.

In Annex 1 there are data concerning the accomplishment of tasks by the users for the ontology of the faculty "Business Informatics" and for the ontology of ROI indicator. Tasks that are on the same line are characterized by a similar degree of complexity.

At first we will concentrate on the results obtained from the realization of tasks for the ontology of the faculty "Business Informatics". In case of performing tasks no. 1 and 3, the correctness of carrying them out is 100%. These tasks consist in searching information basing on finding one term in the semantic network. In orders no. 2, 4 and 5, the correctness of carrying out for all the participants is over 83%. However, this result requires a commentary. Assessing the accomplishment of the tasks in a three-degree scale: *done well*, *done wrongly*, *lack of completeness of information* (but it is correct), in tasks no. 4 and 5 there was no wrong answer. In Annex 1 to the group *done wrongly* incomplete answers, in which user omitted one of classes or the name of one subject,[9] were counted. Also incomplete answers impacted to a significant extent the values in the line *done wrongly* in the task no. 2. In case of the accomplishment of the task no. 6, we got a very high percentage of correct answers (over 95%), but in the task no. 7 there were only over 66% of good answers. This result requires a commentary. Tasks no. 6 and 7 consisted in saving a part of the ontology to the file. The former concerned only one topic and all relations connected to it. In the latter a semantic map was to be more extended. The task no. 7 was done wrongly only by 12% of the participants, whereas 21% of the persons saved the semantic map to the file which contains too many shown topics in comparison with searched information. Particularly among the users with computer education no one carried out this task wrongly, but as many as 25% saved to file too big a fragment of the semantic network. In case of the ontology of the faculty "Business Informatics" there were no significant differences in performing tasks with regard to education (however, the users with computer education accomplished the task most correctly).

Now we will analyze performing tasks for the ontology of ROI. In case of the task no. 1 the correctness of the accomplishment – regardless of education – is 100%. This task, similarly to the ontology of the faculty "Business Informatics", consists in finding in the semantic network one topic. In tasks no. 2, 3 and 4 in line *done wrongly* the values are from 50% (task no. 4) to 36% (task no. 2). This result requires a commentary. Similarly to the accomplishment of the task for the ontology of the faculty "Business Informatics", incomplete answers (user omitted one economic ratio) were counted as wrongly executed. Assessing the accomplishment of tasks in three-degree scale: *done well*, *done wrongly*, *lack of completeness of information* (but it is correct), in these tasks the percentage of wrong answers is from 24% (task no. 4) to 26% (tasks no. 2 and 3). Tasks no. 6 and 7 need the explanation

[9] On account of the limited scope of this publication detailed data was omitted.

as well. Similarly to faculty "Business Informatics" these tasks consisted in saving to a new file a fragment of the ontology. Task no. 6 was done wrongly by 21%, and task no. 7 by 45% of the participants. To group of answers done wrongly are counted the solutions that included too many topics in comparison with required information. In case of task no. 6 it is 9% answers, but for task no. 7–31%. Especially among the users with the computer education nobody performed these tasks wrongly. In next research studies, in case of such tasks, it will be necessary to modify the content of the task and explain to participants that well accomplished task consists in saving a part of the ontology including only essential topics and relations.

In contrast with the ontology of the faculty "Business Informatics", in case of the ontology for ROI there are significant differences in performing tasks with regard to education. Except for tasks no. 1 and 4 the users with computer education gave most correct answers. Assessing accomplishment of the task no. 4 in three-degree scale (*done well*, *done wrongly*, *lack of completeness of information*), 15% of the users with computer education did this task wrong, while as many as 30% did not give all economic ratios. In case of four tasks out of six (tasks no. 2, 3, 4, 6) the participants with computer science and econometrics education performed them better, than those with non-computer education.

Summing up received results concerning the correctness of establishing tasks up, it is necessary to say that according to acquired education, the people with computer education performed best tasks which consisted in searching information with the use of visualization of semantic network of created ontology. But, this conclusion requires further research which would verify it.

In the research, the accomplished task consisted mainly in searching information. In case of the ontology for ROI, in which used names of topics and relations were not known for most users, groups with computer education accomplished task better than other groups. It results most probably from the fact that the participants with computer education/skills have knowledge and experience in using various information systems and human-computer interactions. During the preparation of the next research, tasks to be done by users consisting in practical use of retrieved information should be prepared (e.g. user is to make decision using found data).

4.2. Easiness of task accomplishment – analysis of research participants' opinions

During the part of the research, which was done using usability testing technique, users in subjective way assessed also easiness and speed of tasks performing. Data obtained from this part of the research are presented in Annex 2. In case of the ontology of the faculty "Business Informatics" in tasks 1–6 there is a dominance of answers *very easily (quickly)* and *easily (quickly)*, and no one replied *very hard (long)*. Only 2% of the participants of research marked task no. 7 as *very hard (long)*. This task was indeed the hardest to be done. In case of performing tasks for the ontology of ROI only in task no. 1 there is dominance of answers *very easily (quickly)* and

easily (quickly) (combined 76%). The majority of the participants found tasks no. 2, 3 and 7 easy, whereas in tasks no. 4, 5 and 6 they more frequently chose options: *hard (long)* or *very hard (long)*.

Task no. 5 is worth noting, as the users with non-computer education more often found this task easy than those with computer education. This task was assessed by the users with computer education as the hardest of all. It is possible that knowledge of counting economical ratios possessed by users with non-computer education made finding needed information, and therefore accomplishing task, easier.

Results obtained from the research are quite promising in the context of using topic map to:

– present knowledge on economic ratios,
– search information basing on the visualization of various semantic relations between indicators.

Despite optimistic opinions of the users with non-computer education, in the next research it will be necessary to plan longer training in searching information with the use of semantic network.

4.3. Conclusions and next steps

These studies confirm conclusions described in earlier publications (see [Dudycz 2010b]) that using appropriate names of relations between topics has very important role in topic map illustrating knowledge concerning analysis of economic ratios. Results obtained from the research described herein are promising. However, they require continuation to verify them. Subsequent research should be conducted that will consist in:

– testing application for ontology of ROI indicator with participation of users with various education, in order to confirm obtained data,
– testing another tasks to be done in application for ontology of ROI indicator, in order to state whether tasks in conducted research are comprehensible for people with non-computer education,
– testing another applications of ontologies created for other fields of analysis of economical ratios, in order to verify correctness of accomplishing application for ontology of ROI indicator.

Researches will be continued on the basis model proposed by E. Brangier (*the usage-adaptation-re-engineering cycle*), "which highlights how human adaptations (of the users) are a source of innovation to design new uses" (see [Eilrich et al. 2009]). These studies enable to identify users' needs precisely and may contribute to the development of innovations.

5. Summary and future work

In this article, we introduce the results of our initial research to verify the usability of applying visualization of semantic network. We focused on searching needed in-

formation related to analysis of economic ratios. This study is the first formal user evaluation of an application related to ROI indicator. We elaborated some research actions to assess the usability of applying the visualization of semantic connections in searching information. The assumptions of research were presented and we analysed the obtained results.

The results of the research, despite their initial and fragmentary character, can be found as quite significant. They characterized the usability assessment of applying the visualization of the ontology of chosen economical ratio as interface user – system in searching information with regard to contextual connections. Research will be continued in order to verify using the visualization of semantic network in the process of the analysis of economical ratios. These studies enable to identify potential difficulties in searching information based on topic maps standard. Research will be continued on the basis of created application for ROI indicator as well as of created ontology for chosen early warning system and using applications built based on Ontopia (open source tool to create topic map).

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BADANIE UŻYTECZNOŚCI WIZUALIZACJI W WYSZUKIWANIU INFORMACJI EKONOMICZNEJ W APLIKACJI MAPY POJĘĆ DO ANALIZY WSKAŹNIKA ZWROTU Z INWESTYCJI

Streszczenie: W środowisku biznesowym, gdzie szybki i niezawodny dostęp do wiedzy jest kluczowym czynnikiem sukcesu, efektywne przetwarzanie danych i informacji dotyczących działalności prowadzonej przez przedsiębiorstwo staje się coraz bardziej istotne. Sytuacja ta wymaga od kadry kierowniczej analizowania wskaźników ekonomicznych również ze względu na różnorodne zależności istniejące między nimi. Trwają badania nad zastosowaniem standardu mapy pojęć do odwzorowania wiedzy dotyczącej wskaźników ekonomicznych. Zastosowana wizualizacja sieci semantycznej w mapie pojęć może stanowić cenną pomoc w ekonomicznej analizie danych i podejmowaniu decyzji. W artykule przedstawiono wyniki badania użytkowników końcowych, którzy oceniali użyteczność wizualizacji sieci semantycznej w wyszukiwaniu informacji w zbudowanej aplikacji mapy pojęć dla wskaźnika zwrotu z inwestycji.

Słowa kluczowe: ontologia wskaźników ekonomicznych, wizualizacja informacji, ocena użyteczności wizualizacji w wyszukiwaniu informacji, wskaźnik zwrotu z inwestycji, mapa pojęć.

Annex 1. Tasks to be performed by users and evaluation of their accomplishment

Task list of ontology for faculty „Business Informatics" (BI)	Task list of ontology for ROI indicator (ROI)	Accomplishment of tasks	Breakdown of accomplishment of tasks (%)							
			All participants		Education					
					Computer		Computer science and Econometrics		Non-computer	
			BI	ROI	BI	ROI	BI	ROI	BI	ROI
1. Give number of hours of lecture of given subject	7. Give name of financial statement (balance sheet or income statement) to which given indicator belongs	Done well	100	100	100	100	100	100	100	100
		Done wrongly	0	0	0	0	0	0	0	0
2. List forms of classes from given subject	8. How many ratios is a given indicator related with?	Done well	83	64	90	80	100	67	62	38
		Done wrongly	17	36	10	20	0	33	38	62
3. Give sum of all hours of given subject (all forms of classes)	9. Give names of these topics	Done well	100	62	100	75	100	67	100	38
		Done wrongly	0	38	0	25	0	33	0	62
4. List subjects with tutorials	10. Which ratios are basis of counting given indicator?	Done well	95	50	95	55	89	67	100	31
		Done wrongly	5	50	5	45	11	33	0	69
5. List subjects with exams	11. What arithmetical operation is performed in order to count given indicator?	Done well	95	67	95	70	89	56	100	69
		Done wrongly	5	33	5	30	11	44	0	31
6. Save to file information only on given subject	13. Save to file information on given indicator with specific relation	Done well	95	79	100	95	100	67	85	62
		Done wrongly	5	21	0	5	0	33	15	38
7. Save to file fragment of ontology with all subjects with exams	14. Save to file fragment of ontology containing all indicators that belong to the *balance sheet*	Done well	67	55	75	60	67	44	54	54
		Done wrongly	33	45	25	40	33	56	46	46

Annex 2. Evaluation of easiness of finding information by user within accomplishment of tasks

Task list of ontology for faculty „Business Informatics" (BI)	Task list of ontology for ROI indicator (ROI)	Marking scale of easiness of task accomplishment	Breakdown of accomplishment of tasks (%)							
			All participants		Education					
					Computer		Computer science and Econometrics		Non-computer	
			BI	ROI	BI	ROI	BI	ROI	BI	ROI
Give number of hours of lecture of given subject	Give name of financial statement (balance sheet or income statement) to which belongs given indicator	very easily (quickly)	26	38	25	40	33	22	23	46
		easily (quickly)	48	38	45	30	45	67	54	31
		average	21	14	25	25	11	0	23	8
		hard (long)	5	7	5	0	11	11	0	15
		very hard (long)	0	3	0	5	0	0	0	0
List forms of classes from given subject	How many ratios is given indicator related with??	very easily (quickly)	36	14	30	5	33	34	46	16
		easily (quickly)	33	33	25	45	56	22	31	23
		average	26	22	40	30	11	11	15	15
		hard (long)	5	19	5	15	0	22	8	23
		very hard (long)	0	12	0	5	0	11	0	23
Give sum of all hours of given subject (all forms of classes	Give names of these topics	very easily (quickly)	31	14	20	5	33	34	46	16
		easily (quickly)	40	33	50	45	56	22	16	23
		average	19	22	20	30	11	11	23	15
		hard (long)	10	19	10	15	0	22	15	23
		very hard (long)	0	12	0	5	0	11	0	23
List subjects with tutorials	Which ratios are basis of counting given indicator?	very easily (quickly)	43	2	40	0	44	0	46	8
		easily (quickly)	45	24	45	25	56	22	38	23
		average	7	45	10	50	0	56	8	31
		hard (long)	5	24	5	25	0	22	8	23
		very hard (long)	0	5	0	0	0	0	0	15
List subjects with exams	What arithmetical operation is performed in order to count given indicator?	very easily (quickly)	57	0	55	0	44	0	69	0
		easily (quickly)	38	24	35	20	56	11	31	38
		average	5	24	10	15	0	33	0	31
		hard (long)	0	24	0	35	0	34	0	0
		very hard (long)	0	28	0	30	0	22	0	31
Save to file information only on given subject	Save to file information on given indicator with specific relation	very easily (quickly)	36	5	35	0	33	0	38	16
		easily (quickly)	48	31	55	35	45	33	39	23
		average	10	21	5	15	22	34	8	23
		hard (long)	7	26	5	35	0	11	15	23
		very hard (long)	0	17	0	15	0	22	0	15
Save to file fragment of ontology with all subjects with exams	Save to file fragment of ontology containing all indicators that belong to the *balance sheet*	very easily (quickly)	12	7	15	10	11	11	8	0
		easily (quickly)	21	31	20	40	11	45	31	8
		average	33	29	40	20	34	22	23	46
		hard (long)	31	19	25	20	33	11	38	23
		very hard (long)	2	14	0	10	11	11	0	23