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Dear reader,

I am delighted to write a few words of introduction to this issue of the Scientific Letters of the University of Zilina – COMMUNICATIONS, focused on Humanities and Social Sciences. It is published at a very important time – the profile of the Faculty of Humanities of the University of Zilina has been gradually transformed from the Faculty of Science (established in 1998) to the Faculty of Humanities (since 2010).

Pedagogical and research activities of the faculty cope with the principles of education leading to the idea of knowledge society. There is clearly an upsurge of interest in science and research in our professional field and I believe we can all benefit from thinking and dialogue in this issue. The authors concentrated on illustrating problems and solutions concerning linguistics, philosophy, mathematics, media and library studies.

Research is a particular way of asking questions – sometimes hard questions. There are many challenges – identifying suitable questions, capturing the complexity of intra- and interdisciplinary interactions, etc. For these benefits we need to engage in a dialogue about our research and practice, and the scientific journal COMMUNICATIONS is undoubtedly a part of this process.

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SEME STOCKS OF LEXICO-SEMANTIC FIELDS – A CONTRASTIVE STUDY

The approach to the contrastive study of lexico-semantic fields and their stocks by the method of a matrix analysis is entirely new in lexical semantics. In our research paper we present the results of a comparative analysis carried out on the seme stocks of lexico-semantic fields of the nouns denoting happiness both in English and Slovak. It was preceded by dictionary analyses for the purpose to find and collect all the specified nouns. Their forms and meanings were consequently quantitatively and qualitatively analysed. The objectives of the present lexico-semantic comparison are: a character of the seme stock, individual and common meanings of English and Slovak nouns of happiness and their semantic reference to three domains of human personality.

Key words: *componential analysis, matrix, lexico-semantic field, seme stock, comparative analysis*

1. Componential analysis

Semantic structure of words is studied by the methods of componential and structural analyses which are interrelated. Componential analysis (CA) or lexical decomposition – as one of the main methodologies of structuralist semantics – is a logical development from the lexical field theory as it describes the sense relations among lexemes of a specific field in a formalized, precise, and detailed way. By application of this form of semantic analysis individual meanings of polysemantic words with different componential structure are decomposed into the smallest, further unanalysable semantic components or features – semes. Semes of various level of abstraction are subsequently hierarchically ordered in a highly structured system. They determine the semantic-syntactic environment of the word and influence the choice of other elements the word will be connected with.

1.1 Historical background

CA as a method for describing mutual oppositions between the lexical units of the field has been used since the second half of 1950s by American linguists (e.g. Floyd G. Lounsbury, Eugene Nida, Ward Goodenough, Brent Berlin, Paul Kay, and Wilhelm von Humboldt) as well as European linguists (e.g. Louis Hjemslev, Bernard Pottier, Eugenio Coseriu, Uriel Weinrich, Jerrold J. Katz, and Jerry A. Fodor) who found the common inspiration in structural phonology. American anthropologists used CA for kinship terms, personal pronouns, gradable antonyms, and colour terms. Louis Hjemslev applied it on certain sets of animals and Katz and Fodor on dictionary definitions. In their theory, Katz and Fodor used the terminology of semantic markers (present in the lexical meaning of the studied word as well as in the meanings of other words) and semantic distinguishers which make the studied word specific and unique [1].

1.2 Matrix of lexico-semantic field (LSF)

In the present componential approach we replaced binary features [2], i.e. a traditional and oversimplified organizing principle of semantic analysis, by a two-dimensional structure – a matrix. All lexical units (with all their meanings) obtained by an entire dictionary analysis of two selected explanatory dictionaries were placed in it. Thus we managed to find and study semantic interconnections between the related meanings of different lexical units as well as between different meanings of a specific lexical unit.

In general, a matrix is a rectangular array of objects with a finite or infinite number of lines and columns. An item in a matrix is called an element or segment [3]. If we understand a lexical meaning of the word as a reflective category and if the reflection of reality in the human mind is characterized by the form of a lexeme, depiction of relations among individual units of language becomes very effective and precise when a matrix adapted for this specific aim is used. There are two intersecting dimensions represented by horizontal and vertical axes. The vertical one indicates a lexical stock and the horizontal one indicates a seme stock of the collected language material (see Fig. 1 and Fig. 2).

The composition of a matrix requires an application of a weight theory, by which each element of the seme stock is given different weight. The weight of an investigated lexeme equals the sum of weights of its meanings. The more the meaning is to the left of the

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horizontal axis, the lower its weight is. That means that if the number or importance of the meanings of a lexeme changes, or even if the word ceases to be important for the research, the matrix can be instantaneously readjusted and the work with the updated data is carried out.

2. Language data

2.1 Lexical stock

Happiness lexis of the present Slovak language is formed by 165 nouns. It is quantitatively smaller in comparison with the English one which contains 199 nouns. English and Slovak nouns of happiness are arranged according to the degree of polysemy [4] in descending order and put on vertical axes of the Matrices of LSFs (see Table 1, Fig. 1–2).

Lexical stock of English and Slovak nouns denoting happiness Tab. 1

Degree of polysemy	English lexemes		Slovak lexemes	
High	27	13.56 %	1	0.61 %
Middle	102	51.26 %	19	11.52 %
Low	60	31.16 %	101	61.21 %
Monosemantic nouns	10	5.02 %	44	26.66 %
Total	199	100 %	165	100 %

2.2 Seme stock

The seme stocks of English and Slovak language material are obtained by an application of CA. They contain semes which were singled out from the meanings of English and Slovak nouns of happiness. Our approach to semantic analysis presupposes the fact that the meaning of every lexeme can be analysed in terms of its semantic components which can be either specific for an individual lexeme or common for several different lexemes of the field. Thus, different meanings of the nouns of happiness are expressed and precisely distinguished by the combination of certain semantic features or semes. This helps us to define more economically and precisely the semantic relations between the nouns and specifies what components of meaning either connect or differentiate the lexical units under study.

2.1.1 Seme stock of English nouns denoting happiness

The seme stock of the nouns denoting happiness in modern English language is made up of 159 semes. The method of CA is applied on all lexical meanings of the collected nouns and is justified due to the fact that the meanings of the nouns denoting happiness consist of semes by which all the English vocabulary can be described.

The semes are divided into 6 groups and put on the horizontal axis of the Matrix of LSF of the nouns denoting happiness in English. Their classification is done on the basis of the frequency of their occurrence in semantic structures of the nouns, i.e. according to their degree of functionality. Thus we distinguish polyfunctional semes, semes with a limited functionality and monofunctional semes (see Table 2). M. Fabian mentions "chain correlations" and claims that the lexical meanings of the English nouns denoting happiness are interrelated and one can be explained through the other, the second through the third, etc. Chain correlations can thus explain the repetition of the same signs in the structural organization of lexical units [5]. On the basis of our research we also agree with her assumption that the more often the seme is met in the lexical meanings of a big quantity of words, the more general and more deprived of emotional colouring it is [6].

We can illustrate it on the following examples:
1. *state, condition of; one who...; expression of; means of*, instrument of are polyfunctional, very abstract, and general semes of the field,
2. *payment; bravery; shining; fit, attack* are less functional semes with a stronger semantic colouring.

Seme stock of English nouns denoting happiness Tab. 2

Groups	Semes		Number of lexemes	Degree of functionality
I.	15	9.4 %	96–19	Polyfunctional
II.	12	7.5%	17–8	Polyfunctional
III.	21	13.2%	7–4	Polyfunctional
IV.	16	10.7%	3	Limited functionality
V.	26	15.7%	2	Limited functionality
VI.	69	43.4%	1	Monofunctional
Total	159	100 %		

2.1.2 Seme stock of Slovak nouns denoting happiness

The seme stock of the nouns denoting happiness in the contemporary Slovak language includes 108 semes and is put on the horizontal axis of the Matrix of LSF of Slovak nouns denoting happiness. The semes are classified and divided into 4 groups on the same principle as the set of semes characterizing the meanings of the English nouns denoting happiness, i.e. according to their degree of functionality (see Table 3). Thus, we obtain 30 polyfunctional semes (1st and 2nd group) which characterize the meanings of 21–4 nouns, 25 semes with a limited functionality (3rd group) presenting the meanings of 3–2 nouns and 53 monofunctional semes (4th group).

Declination of the emotional colouring indirectly depending on the semes' functionality can be seen from the following examples:
1. semes *stav* (occurs in the meanings of 21 polysemantic nouns of happiness), *vlastnost* (semantically interconnects 20 nouns)

and *prejav, preukazovanie* (common for 18 nouns) are the most functional of all the semes under study and obviously they are very general,
2. semes *laska ku, apatia* are monofunctional and their emotional colouring is incomparably higher.

On the other hand, semes of a higher functionality have a higher degree of abstraction which is directly proportional to the rate of the integrity of the component of meaning in the language system. Semes *stav; vlastnost; prejav, preukazovanie; frazeologizmy; prijemny, pozitivny pocit, etc. versus laska ku, apatia; titul; jedlo; hnutie; vzlietnutie, baldachyn, etc.* confirm this statement.

Seme stock of Slovak nouns denoting happiness Tab. 3

Groups	Semes		Number of lexemes	Degree of functionality
I.	10	9.26 %	21–10	Polyfunctional
II.	20	18.52 %	8–4	Polyfunctional
III.	25	23.15 %	3–2	Limited functionality
IV.	53	49.07 %	1	Monofunctional
Total	108	100 %		

3. Objectives of comparison

In the present comparative analysis we concentrate on:
- the character of the seme stocks of LSFs of the nouns denoting happiness in English and Slovak,
- common and individual meanings of English and Slovak nouns denoting happiness and relations between them,
- the semantic reference of English and Slovak nouns denoting happiness to three domains of human personality.

3.1 Character of the seme stocks

As regards the contents of the seme stocks of English and Slovak nouns of happiness, the percentage share of English and Slovak polyfunctional, monofunctional semes, and semes with a limited functionality is nearly the same (see Table 4). The contrastive study of the collected English as well as Slovak semantic material results in the conclusion that the richer the seme stock of a concrete noun is, the more possibilities it has for the semantic relations with other nouns of the field. This is the reason why English nouns *rest, love, fortune, relief, repose*, etc. and Slovak nouns *srdce, laska, pokoj, milost,* etc. having the highest number of meanings within their LSFs, can serve as the main centres of semantic relationships in later stages of the research.

Monofunctional semes form the most numerous group of the seme stocks of English as well as Slovak LSFs of the nouns denoting happiness. The most polyfunctional semes have a general character in both languages. The range of English nouns, from the meanings of which these semes have been obtained is wider than the range of Slovak nouns – there is a lower amount of Slovak nouns with a high and middle degree of polysemy.

Seme stocks of English and Slovak nouns denoting happiness Tab. 4

Degree of functionality	English semes		Slovak lexemes	
Polyfunctional	48	30.2%	30	27.8%
Limited functionality	42	26.4%	25	23.1%
Monofunctional	69	43.4%	53	49.1%
Total:	159	100%	108	100%

It is evident from the Matrices of LSFs of the nouns denoting happiness in Slovak and English that different meanings of polysemantic nouns have different componential structure and there exists a relation between lexemes and semes which can be notified as *1:x* for $x > 1$ (x represents the number of semes). The only exception in the research is the case of monosemantic lexemes which are in one-to-one correspondence with the appropriate semes ($x = 1$).

3.2 Common and individual meanings of English and Slovak nouns of happiness

The results of a comparative analysis (carried out on both English and Slovak semes not having their correspondences in the Slovak and English seme stocks) show that semes in the English language refer to attributes of people as well as things that surround them more often than their Slovak counterparts. English semes differ from Slovak ones in indicating not only the interests and desires of people but also their ways of thinking, perception, awareness, and understanding the surrounding environment. General character of eighteen of them and indication of emotional expressiveness and compensation for an effort or of punishment by three of them make the mentioned English semes unique in this comparison, too.

On the other hand, Slovak semes refer more frequently to things that make the human life pleasant and comfortable and to psychological processes proceeding in human minds. As to physical processes and their indication by Slovak and English semes, the same number of Slovak and English semes has been collected. Expression of human abilities and activities bringing fun to everyday life and making it easier as well as expression of specific fields of study, research, and thought by English and Slovak semes is quantitatively very similar. Only one Slovak seme indicates the result of a human activity in comparison with its seven English counterparts. A part of atmosphere characterized by one Slovak seme does not have its counterpart in the English seme stock.

Comparative analysis of English and Slovak semes Tab. 5

Semantics of semes	English semes	Slovak semes
psychological processes	3	8
psychological states	5	3
physical processes	4	4
physical states	4	6
human abilities	2	3
results of human activities	7	1
activities bringing fun to everyday life	4	3
activities making the life easier	6	5
activities making the life meaningful	5	2
things making the life pleasant and comfortable	–	7
a part of atmosphere	–	1
things/conditions/activities bringing complications to life	4	2
specific fields of study, research, thought, terminology	3	4
generality of meaning	18	–
attributes of things	9	–
interests and desires of people	2	–
way of thinking and perception	6	–
human qualities	10	–
emotional expressiveness	1	–
compensation for sth	2	–
Total number	95	49

Semantic reference to three domains of human personality

The semantic reference of the nouns denoting happiness to three major domains of human personality shows that the tendency of English people to be pleasant, emphatic, and helpful in social situations is comparable to that of Slovak people. On the other hand, English people are far more extrovert and assertive than Slovak people. Their emotional stability is also considerably higher in comparison with the emotional stability of Slovak people who have less self-confidence, assertiveness, and extroversion. It is connected with their troubled history, centuries of Hungarian oppression, and decades of communist regime. They are sensitive to criticism, to being called Eastern-Europeans or Czechoslovakians. They desire for recognition as a mature European state with its own national identity [7].

4. Conclusion

Having studied the common meanings of English and Slovak nouns of happiness, we come to the conclusion that both English and Slovak people realize that a necessary condition of obtaining happiness is to concentrate on positive things, ideas, and values in their lives, to use all energetic potential and find emotional stability which will enable them to make important changes in their lives. A higher power or universal intelligence are very often the sources of their inner peace, and support them in various life situations.

People of both nations seek satisfaction and happiness also in some form of external convivial entertainment or festive dissipation. They are open to manifestation of their feelings, and thoughts. Expressions of their attitudes to active and passive entertainment as well as relations to people, who deserve attention, are very similar, too.

Both English and Slovak languages are characterized by the presence of extensive seme stocks, and semantic reactivity of polysemantic nouns denoting happiness not only with other nouns of the fields of happiness but also with the nouns of other fields of English and Slovak lexis. Typological comparison of LSFs of the nouns denoting happiness has shown their common, partially common, as well as unique qualitative and quantitative features.

Semantic reference to three major domains of human personality Tab. 6

	English nouns	*Slovak nouns*
Extraversion	jocundity, zest, brio, cheerfulness, fervency, élan, enthusiasm, ardour, zestfulness, vim, verve, vitality, exuberance, jubilation, jocosity, elation, gusto, heartiness, pep, cordiality, jocoseness, conviviality, lightsomeness, joviality, hilarity, sprightliness, fervour, chirpiness, zestfulness, joyousness, friskiness, jollification, alacrity, playfulness, frolicsomeness **(35)**	zapal, elan, zapalenie, zapalenost, odusevnenie, verva, odusevnenost, nadsenie, nadsenost, entuziazmus, nadchnutie, nadchnutost, horlivost, veselost, vitalnost **(15)**
Agreeableness	warm-heartedness, beneficence, benefaction, altruism, kindliness, goodwill, philanthropy, optimism, heartiness, cordiality, amity, affectionatess, amiableness, amiability, pleasantness, pleasurableness, tenderness, fondness **(18)**	dobrota, dobromyselnost, dobrodusnost, dobroprajnost, dobrosrdecnost, ziclivost, privetivost, dobrodenie, dobrodinstvo, dobrackost, dobractvo, blahovolnost, blahoprajnost, dobrocinnost, filantropia, ludomilnost, altruizmus, optimizmus, priatelskost, neznost **(20)**
Emotional stability	soundness, calmness, contentedness, placidness, placidity, tranquillity, peacefulness, stillness, quiet, fulfilment, equanimity, serenity, comfortableness, lightheartedness, reposefulness **(15)**	pokoj, vyrovnanost, mier, pohoda, rovnovaha, vyrovnanost, pokojnost, uvolnenost **(8)**

Count	Lexical stock \ Seme Stock	67 In phrases	54 In plural	29 Figurative meaning	54 That which.....	29 Science	19 Art	8 Place, stay	14 Freedom from	12 Quietness, tranquillity, peace, calmness	3 Sport	5 Part of	2 Support for	12 Absence of	6 Repose, relief, release from	9 Vigour, strength, power, energy	2 Rest, cessation, stopping, arrest	21 Biblical, religious use	89 Quality, attribute, trait
16	Rest	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆		
16	Love	◆	◆	◆	◆		◆				◆		◆					◆	◆
13	Fortune	◆	◆	◆	◆	◆													◆
13	Relief	◆		◆	◆	◆	◆												
13	Repose	◆			◆	◆	◆	◆		◆				◆	◆		◆	◆	
12	Heart	◆	◆	◆	◆	◆						◆							
12	Pride	◆	◆	◆	◆		◆												◆
12	Triumph	◆	◆	◆	◆														
12	Joy	◆	◆		◆	◆		◆										◆	◆
12	Safety	◆	◆		◆	◆			◆		◆	◆							◆
12	Content	◆	◆		◆	◆						◆							
12	Goodness	◆	◆		◆													◆	◆
12	Liking	◆	◆		◆														
11	Charity	◆	◆		◆		◆											◆	
11	Salvation	◆			◆													◆	
10	Heaven	◆	◆	◆	◆	◆		◆										◆	
10	Freedom	◆	◆	◆	◆	◆								◆	◆				◆
10	Charm	◆	◆	◆	◆	◆													◆
10	Felicity	◆	◆		◆	◆													◆
10	Comfort	◆	◆		◆				◆										◆
10	Pleasure	◆			◆	◆													◆
10	Peace	◆			◆				◆	◆				◆				◆	
10	Satisfaction	◆				◆									◆			◆	
10	Jollity		◆																◆
10	Weal		◆																
10	Pleasance				◆		◆												◆
9	Sunshine	◆	◆	◆															
9	Mirth	◆	◆		◆		◆											◆	
9	Cheer	◆	◆		◆														
9	Rapture	◆	◆				◆											◆	
9	Kindness	◆	◆																◆
9	Welfare	◆	◆																
9	Lightness	◆		◆					◆					◆					◆
9	Delight	◆			◆														◆
9	Jest	◆			◆														
9	Ease	◆							◆					◆	◆				◆
9	Vivacity		◆	◆			◆												◆
9	Gratification		◆		◆														
9	Affection		◆			◆													◆
9	Relish																		
8	Friend	◆	◆	◆	◆													◆	
8	Luxury	◆	◆		◆														◆

Fig. 1 Matrix of LSF of English nouns denoting happiness – upper left part

Pocet	Seme Stock / Lexical stock	18 Frazeologizmy	17 Veda	11 To, co...	4 Expresivny vyraz	8 Ludova slovesnost	2 Oslovenie	1 Stred	1 Cast	1 Jedlo	2 Zivot	1 Kartarsky vyraz	7 Kladny vztah, postoj	5 Naklonnost, naklonenost	6 Osoba, clovek	7 Predmet, vec	13 Nabozenstvo, Biblia	22 Stav	6 Sulad, zhoda, harmonia	5 Vyrovnanost, rozvaha, pokoj
11	Srdce	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆								
6	Laska	◆				◆							◆	◆	◆	◆				
6	Pokoj	◆															◆	◆	◆	◆
6	Milost	◆															◆			
5	Radost	◆		◆		◆												◆		
5	Stastie	◆			◆	◆												◆		
5	Nebo	◆			◆												◆			
5	Extaza		◆														◆	◆		
5	Dobrota																	◆		
5	Sloboda																	◆		
4	Dobro	◆	◆																	
4	Potesenie	◆		◆														◆		
4	Raj	◆			◆	◆											◆			
4	Pohoda	◆																		◆
4	Idyla		◆								◆							◆		
4	Harmonia		◆																◆	
4	Zdar			◆															◆	
4	Zabavka															◆				
4	Pozehnanie																◆			
4	Mier																	◆	◆	◆
4	Obluba																			
3	Selanka	◆	◆																	
3	Miazga	◆	◆																	
3	Nirvana	◆															◆	◆		
3	Orfizmus		◆														◆			
3	Euforia		◆															◆		
3	Optimizmus		◆															◆		
3	Idealizmus		◆																	
3	Zapal		◆																	
3	Humanizmus		◆																	
3	Vitalita		◆																	
3	Potecha			◆														◆		
3	Priatel					◆	◆													
3	Eden					◆											◆			
3	Gusto					◆														
3	Naklonnost												◆							
3	Dobromyselnost													◆						
3	Blazenost																◆	◆		
3	Nebesa, nebesia																◆			
3	Vytrzenie																	◆		
3	Plezir																			
3	Zabava																			
3	Rozptylenie																			
3	Radovanky																			
3	Dobrotivost																			
3	Laskavost																			

Fig. 2 Matrix of LSF of Slovak nouns denoting happiness – upper left part

Especially remarkable are quantitative distinctions – i.e. different amount of semes characterizing the lexical meanings of the nouns under comparison.

On the basis of the research we came to a conclusion that English and Slovak nouns together with their meanings do not fill the same semantic space in their LSFs and do not have the same semantic character. Their LSFs have their own unique and original external and internal structures, and relations between their specific elements. They present national, social, cultural, and individual peculiarities of happiness expression, fix collective stereotypes, physical and mental states and processes of people. Furthermore, elements of both LSFs also speak for the existence of general and deep semantic relations, conditioned by logically-psychological mechanism of human thinking.

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THE ROLE OF -ING IN CONTEMPORARY SLAVIC LANGUAGES

The article deals with words of English origin (with the terminal suffix -ing) which have penetrated into contemporary Slavic languages. The general introduction into the characteristics of -ing lexemes in the English language as well as principles of lexical unit adaptation are provided. The main emphasis is put on orthographic, morphological, word-formation and semantic adaptation of the lexical units in the Slovak, Russian and Czech languages.

Key words: *loan word, anglicism, -ing participle, orthographic, morphological, word-formation and semantic adaptation.*

1. Introduction

One cannot consider the usage of anglicisms with the *-ing* ending to be a new phenomenon but in the contemporary social situation the occurrence and significance of these lexical units increases – this is the reason why we have concentrated on this specific field of vocabulary. The dictionaries of slang and neologisms in the studied languages have become the source material of the research [2] [4].

The goals of the research of lexical units which bear the terminal suffix *-ing* are developed in the following intentions:
- to provide characteristics of a specific layer of lexicon as a complete synchronic issue which reflects synchronic dynamics accompanied by integration changes from penetration into the system of a Slavic language through word-formation processes to semantic processes;
- to depict how language systems and language users cope with the process of acceptation of these anglicisms;
- to describe the contemporary nature of the process taking into consideration their adaptation and impact on the communication process course.

The above mentioned adaptation concerns these aspects of a lexical unit [1]:
- distribution and utilization of the loan word;
- stylistic characteristics;
- phonetic and morphological characteristics;
- semantic adaptation;
- word-formation incorporation;
- incorporation into synonymic, homonymic and antonymic relations;
- incorporation into syntagmatic relations;
- relation of the loan word to the hitherto expression of the notion.

Our comparative analysis has its roots in the morphological features of the *-ing* lexical units in English. In the English language the present *-ing* participle is called nonfinite; it is one of the nonfinite forms of the verb [3]. It occurs as a nonfinite form in the progressive aspect following the verb to be and *-ing* participle clauses. The *-ing* participle form is almost invariably predictable from the base.

Studying verbal grammatical categories, the distinctions of aspect are the only ones which are expressed when taking into account structural possibilities of a single nonfinite verb phase. The perfective/nonperfective contrast is sometimes possible in an *-ing* participle phrase in adverbial clauses; on the other hand, the *-ing* participle phrases are not capable of expressing the progressive/nonprogressive contrast, since the *-ing* participle is not necessarily associated with the progressive.

Moreover, there are constructions in which the *-ing* participle construction is progressive in meaning and has aspect contrast with the infinitive.

In the English language there are adjectives that have the same suffix as the participle in *-ing*. They are called participial adjectives. The difference between the adjective and the participle is not always clear-cut. When a direct object is present, the participle is the function for the *-ing* form. On the other hand, premodification by the intensifier *very* is an indication that the form is an adjective [3].

The participle sometimes achieves adjective status when it is connected with another element. When an *-ing* form occurs on its own or is preceded by a genitive noun phrase, the construction becomes ambiguous between an *-ing* clause and a noun phrase with a verbal noun in *-ing* as its head.

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The possibility to modify a noun by a present participle depends on the potentiality of the participle to indicate a characteristic feature. The premodification by the *-ing* participle is a current trend in journalism and technical writing.

An *-ing* form may also be [3]:
- a concrete count noun referring to what results from the action of the base (*opening*);
- a concrete noncount noun with reference to the material of which the base is made (*panelling*);
- an abstract and noncount noun which describes the activity connected with the base (*framing*);
- an abstract count noun which expresses the occasion of the base verb's activity (*christening*);
- occasionally a noncount noun (*clothing*).

Noun compounds created from a verbal noun in *-ing* plus subject (*working party*); object plus verbal noun in *-ing* (*brainwashing*); verbal noun in *-ing* plus adverbial (*waiting room*) and obligatory plurals (*savings*) are very productive ways of forming new lexical units.

Some *-ing* participial forms can even function as marginal prepositions, nonfinite verb forms, conjunctions.

The gradience from deverbal nouns via verbal nouns to participles is illustrated in the following examples:
some paintings of Cooper's – deverbal noun; concrete count noun;
the painting of Cooper is as skilful as that of Smith – verbal noun; abstract noncount noun;
Cooper's deftly painting his son is a delight to watch – gerund;
Cooper is painting his son – participle.

2. Orthographic adaptation

When taking into account orthographic adaptation of anglicisms into the contemporary Slovak and Czech languages, the generally valid rules in the sphere are kept; on the other hand, in the Russian language they have most often acquired an orthographic form which is not stated in currently valid rules.

It arises from the orthographic analysis of anglicisms that their vocalic structure contains phonetic or graphic elements of the original English lexical unit. Moreover, an anglicism may hold one meaning in two or more orthographic forms. In other words, the analyzed anglicisms are:
a) graphically motivated: *roaming* (SL); *интернет-банкинг* (RL); *casting* (CL);
b) phonetically motivated: *miting* (SL); *брифинг* (RL); *antidumpingovy* (CL);
c) phonetic-graphically motivated: *kanoning* (SL); *рерайтинг* (RL); *raketyring* (CL);

Two, three or even four forms of one lexical unit appear in all the observed languages:
skrining – screening; snouboarding – snowboarding; camping – kemping; carving – karving; carvingovy – karvingovy; casting – kasting; castingovy – kastingovy; factoring – faktoring; canyoning – kanoning; telerekording – telerecording; treking – trekking; trekkingovy – trekingovy; catering – ketering (SL);
хепеннинг – хеппенинг – хэппенинг; тагинг – тэгинг; франчайзинг – френчайзинг; франчайзинговый – френчайзинговый (RL);
dampingovat – dumpingovat; antidampingovy – antidumpingovy; racketeering – raketyring; franchisingovy – franchisovy – franzizingovy – fransizinkovy (CL).

The most common variation represents the contrast of a double consonant and a single consonant:
skiping – skipping; dresing – dressing; mobing – mobbing; lobing – lobbing (SL);
шоппинг – шопинг (RL); *modeling – modelling* (CL).

There exist also lexical units which are written together or separately in the same meaning:
home banking – homebanking (SL);
кикбоксинг – кик-боксинг (RL);
bodybuilding – body building (CL).

The Czech language is the only one where the terminal letter *-k* has been accepted instead of *-g*: *briefing – brifing – brifink; trenink; dresink – dressing; fransizing – fransizink.*

The Russian language offers the widest range of possibilities of anglicisms orthographic adaptation. In order to highlight this phenomenon, the most common ways of vowels and diphthongs orthographic adaptation of *-ing* participles in the Russian language are classified below.

3. Morphological adaptation

Morphological features of these anglicisms in the studied Slavic languages are the combination of Slavic and English morphological features of individual word classes. At the same time, word classes borrowed from English acquire grammatical categories which are typical of the corresponding word classes in the Slavic languages.

The morphological analyses prove that the *-ing* ending is a suffixal terminal element with an independent processual meaning, since in the Slavic languages the root morphemes usually do not bear this semantic mark.

The studied anglicisms belong to masculine nouns in all the three languages: *e-banking; face-lifting; multitasking; sampling; shopping* (SL); *банкинг; допинг; неккинг; пейджинг; роуминг* (RL); *biking; sponzoring; lobbing; gambling; peeling* (CL).

Most of them undergo declination processes (except for the following group of nouns in the Slovak language *action painting; clearing house; coming-out; rooming-in; sightseeing tour).*

Ortographic adaptation of *-ing* participles in the Russian language (vowels/diphthongs) Tab. 1

vowel/diphthong	original form	adapted form
e [I] e	*rewriting*	*рерайтинг*
u [u:] ю	*tuning*	*тюнинг*
a [ɒ] o	*swapping*	*своппинг*
a [ɑ:] a	*targeting* *casting*	*таргетинг* *кастинг*
u [ʌ] e	*antidumping*	*антидемпинговый*
a [æ] e	*branding*	*брендинг*
a [æ] a	*banking*	*банкинг*
i [I] и	*lifting*	*лифтинг*
e [e] э	*ending*	*эндинг*
e [e] e	*spelling* *armwrestling*	*спеллинг* *армрестлинг*
o [ɒ] o	*jogging*	*джоггинг*
aw [ɔ:] o	*trawling*	*троллинг*
ee [i:] и	*speedskating* *screening*	*спидскейтинг* *скрининг*
ie [i:] и	*briefing* *piercing*	*брифинг* *пирсинг*
ea [i:] и	*dealing* *leasing* *freaking*	*дилинговый* *лизинговый* *фрикинг*
i [aI] ай	*siding* *diving*	*сайдинг* *дайвинг*
a [eI] ей	*speedskating* *dating* *shaping*	*спидскейтинг* *дейтинг* *шейпинг*
a [eI] a	*catering*	*катеринг*
i [aI] ай	*writing* *highjacking*	*райтинг* *хайджекинг*
o [əʊ] o	*opening* *holding*	*опенинг* *холдинг*
y [aI] ай	*styling*	*стайлинг*
y [aI] и	*recycling*	*рециклинг*
a [eI] ей	*paging*	*пейджинг*
ow [əʊ] oy	*bowling*	*боулинг*
ow [aʊ] ay	*downshifting*	*дауншифтинг*
oa [əʊ] o	*snowboarding* *skateboarding*	*сноубординг* *скейтбординг*
oa [aʊ] oy	*coaching* *roaming*	*коучинг* *роуминг*
oa [ɔ:] oa	*cloaking*	*клоакинг*
ai [eI] e	*autotrainig*	*аутотренинг*

The following features are marked as marginal: one noun in the Slovak language is classified as pluralia tantum: *stoping;* in the specific case of *онгоинг* it is a deverbal adjective in the English language and a substantive in the Russian language.

4. Word-formation adaptation

The following word-formation processes find their realization when transferring the *-ing* anglicisms into the Slovak, Russian and Czech languages: derivation and compounding. Other word-formation processes (shortenings, acronyms, blending, conversion, calques, univerbization) have not been realized at all. Derivation processes and derivates represent the most numerous group. The derivation of word classes from word-formative bases is realized mostly by means of suffixation.

In the Czech language only adjectival derivates have been observed: *antidopingovy; fransizingovy; holdingovy; castingovy; leasingovy; liftingovy; marketingovy; pagingovy; ratingovy; roamingovy; cateringovy.*

Adjectival and adverbial derivates are present in the Slovak language: *dampingovy – dumpingovo; treningový – treningovo; raomingovy; mitingovy; dresingovy; kanoningovy; kempingovy; cateringovy; telerekordingovy; snoubordingovy; skipingovy.*

The Russian language is the most productive in the field of derivation; adjectives, nouns and verbs are created from English *-ing* lexical units: *дилинговый; кастинговый; катеринговый; лизинговый; шоппинговый; шоппинговать; демпинговать; допинговый; картингист; роуминговый; консалтинговый; лифтинговый; маркетинговый; пейджинговый; рейтинговый.*

In some cases the derivates build the basis for word-formative nests:
kliring – kliringovy – kliringovo;
виндсёрфинг – виндсёрфингист – виндсёрфингистка;
демпинг – демпинговый – антидемпинговый.

The combination of a Russian word base and the *-ing* ending occurs rarely: *Путинг* = митинг или тусовка путиноидов.

The processes of compounding are present only in the Russian language within the studied field: *рейтинг вопроса; рейтинг команды; холдинговая компания.*

In the case of hyphened compounds, the first part of it does not undergo declination: *холдинг-компания; шоппинг-центр; шоппинг-терапия; допинг-тест; рейтинг-лист; датинг-моб.*

5. Semantic adaptation

Taking into account the relationships between the form and meaning of anglicisms it is possible to state that from the semantic point of view the core of the anglicisms represent monosemic lexemes:
ballooning; face-myolifting; deltaplaning (SL);

дрессинг; кёрлинг; миолифтинг (RL);
biolifting; petting; teleshopping (CL).

At the same time, cases of polysemy (*autokemping; timing; dispecing; franchising; telerekording; trekking; feeling; mobbing; rating; styling* (SL); *райтинг; рейтинг; троллинг; спеллинг; рерайтинг; хостинг* (RL)) in the Slovak and Russian languages and homonymy (*surfing; happening; lifting; miting; imprinting; skauting*) in the Slovak language prove the hypothesis that the more frequent a word is the more striking the above mentioned relationships are; nearly all polysemic and homonymic units belong to the core of the anglicisms.

Moreover, only a limited number of the studied lexical units enter mutually synonymic or antonymic relations: *dopingovy – antidopingovy* (CL).

6. Conclusions

The analysis of the gathered material shows certain characteristics in the group of *-ing* anglicisms which have penetrated into contemporary Slavic languages. Not all the studied anglicisms in the given period have undergone an analogically adaptation process; in other words, the usage in the field of loan words adaptation into Slavic languages is not homogenous. One cannot provide strict rules of anglicisms functioning on system level; on the basis of material corpus it is possible to highlight only certain tendencies of integration adaptation processes.

In the end we would like to point out that our analysis is not based on an absolute completeness of the lexical material as the word stock represents an open system which is being developed and enriched by new lexical units.

Perspectives of the research are seen in these aspects:
- phonetic characteristics;
- other semantic relations; semantic shifts compared with original meaning in the English language;
- etymology of individual components;
- incorporation into syntagmatic relations;
- incorporation into individual functional styles;
- statistical representation of individual characteristic features.

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Ingrid Cibikova *

TERMINOLOGICAL ANALYSIS OF PUBLIC ADMINISTRATION. KEY RESEARCH OUTCOMES

The research carried out by the author has been focused on the terminological analysis of Slovak and English terms used in the subject field of public administration especially in translation. The author based her research on the theoretical knowledge gained in the field of terminology, as the field researched and part of translatology, interdisciplinary science and textual linguistics. The author presented current trends in Francophone terminological thinking and practice: socioterminological, textual and translation terminology. A large number of public administration terms are analyzed thoroughly, compared to concepts, definitions and contextual match. The author also monitors Slovak terminology and describes all the synonyms for the English equivalents. After the terms are discussed with experts, preferred English equivalents used in practice are given to them. Finally, the author describes the innovative terminological analysis and specifies a term acceptability rating.

Key words: *terms, concepts, definitions, variants, terminology work, terminological context, terminological analysis, concept oriented terminology.*

1. Introduction

Public Administration terminology is a very topical problem because of never-ending reforms and changes. Public administration is really a public issue. Many factors were important for the choice of this study: public topic, reception, application and utilization of new terminological thinking in Slovak environment, social, political, cultural changes in Slovakia after 1989, influx of special texts and new terms, changes in special communication, missing comparative studies and analysis to confront current national concept systems changes in various subject fields and missing bilingual glossaries. In that time, paradoxically, Slovak terminology monitored its falloff in the systematic terminological work. Every day practice indicates that professional and prescriptive terminology regulation is necessary in both national and supranational levels and this way prevent its spontaneous development and special communication misunderstanding.

The terminological analysis revealed inconsistency, ambivalency and bad quality translation. A considerable variation and inconsistency of English equivalents has had an influence on the Slovak Public Administration terminology, terminological differences of some authors in special languages.

One of the objectives was to delimit concept oriented terminology in the field of Slovak Public Administration terminology, and after the comparative analysis of concepts, definitions and terminological contexts, to specify the English preferred equivalents. Innovative and useful terminological management proposals can ensure the translation quality of official documents; can improve the process of cognitive dissemination in the field of cultures and reforms carried out in public administration in European countries. English has become Lingua Franca as a result of language and culture development. It also represents a link between national and global terminology and a compromise in an effective international communication. Unambiguous, constant and consistent terminology used effectively and properly in the field of public administration by the peoples in Europe proves that it deserves our attention.

2. New terminological thinking

Modern theoretical declarations and terminological thinking abroad, especially in Francophone countries inspired us and they related to practice requirements in Slovakia. The starting point for our research were the works of Slovak terminological school, mainly of Horecky, and Masar; foreign terminological schools, mainly in Great Britain, Austria, and Canada; well-known linguists and terminologists (Sager, Wuster, Cabre), institutional basis functioning, databases, terminological committees, practice requirements and international standards recommendations. After that we presented current trends of terminological thinking and practice: socioterminological, textual and translation terminology. These theories are corroborated by their application in the framework of analyses of selected domain terminology in public administration in two languages. We dealt with new streams of textual terminology, translation terminology and socioterminology. Apart from the fundamental historical overview of terminological theories we concentrated on terminological standards, ways of term definition, dynamical processes in terminology and terminological context which has not been discussed much in Slovakia yet. Terminological context has some fundamental functions: existential, defining, explanative and

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selective. Translation and scientific practice shows that context requires detailed research. The textual match information and degree of context equivalence is one of the most important aspects of equivalent alternative in a target text.

3. Terminology work and management

In terminological work we discussed its management and planning, proven approaches of excerption, harmonization, and terminography, systematic, effective, goal-oriented manipulation with terminological data. On the basis of obtained knowledge and different views we adapted the terminological work to the current state and development of the field of public administration and terminology users. After comparing technical and socioscientific terminology in terms of *Stolze's terminology* [26] (1999, p. 43) we tried to define socioscientific term. New findings were implemented into our definition of socioscientific term: "Socioscientific term is approximate designation of the concept whose meaning is determined by the definition relevant to a historical period on the bases of standards, conventions, compromises, cultural thinking and language potential. It is integrated into an open conceptual system of subject field and used in certain type of context" [2] (Cibikova, 2009, p. 55).

To emphasize the social concepts of the terminological work we have set up goals to deal with public administration terms valid and used in sociolinguistic contexts. According to the recommendations given in the standard on socioterminology we aimed research at the fact how terminological variants and socioterminology are used and accepted by people and specialists. Then we disputed socioterminology with the connection to terminological standardization and localization. We pointed out and recommended the uses of the terminological standard ISO/TR 22134: "Practical guidelines for socioterminology"in terminological work especially in national terminologies management [15].

We explicated a mutual connection between translation of a special text and terminology, referring to J. Sager's paper "The translator as terminologist": "Translation is a decision making process. Nowhere is this more clearly visible than in the choice of words. We all identify words in context, we find words in a dictionary, or we think we know words. What makes us sure we can trust our understanding of the words we translate and how do we make sure that the readers of our translations understand what we intend them to understand? Terminology provides a partial key to understanding words and the mechanisms of their formation and use. This is justification enough for including a course in terminology in the programme of translator training" [25].

In research part of "Subject field of public administration" we specified the public administration concept by selecting the sources for corpus and languages. We put more emphasis on currency and topicality of documents. We considered scientific literature and laws for non-experts in the field of public administration as the best and most authentic source of information to get a general view of the field and definitions. As a drawback we could consider variety of texts and public administration documents and their translation. Except linguistic there are also conceptual, constitutional, historical and cultural differences within the public administration term systems in Slovakia and English-speaking countries. Nowadays terminologists emphasize the compatibility of conceptual, linguistic, sociocultural and political systems. It is not true the *Wuster's* statement that there should be just one designation for each concept. It is evident that there are terminology synonyms and variants. Current conceptual systems often differ from culture to culture and only proper names, units of measurement and numbers seem to be context independent.

Another drawback from the view of translation authenticity was that we used texts adjusted for the Slovak republic conditions by translators and public administration reformers. It was really difficult to search for original and authentic English equivalents and term definitions on the websites of British government (fee-paying website of Oxford Journal), or in monographs, or in encyclopedia. We searched for translated public administration documents in Slovakia on government websites which might be the authentic source of information for terms excerption. We decided for the texts and official translations of legal regulations (The European Charter of Local Self-Government, Official Journal of the European Union...). In an effort to acquire professional competence we studied public administration as a science, laws and regulations, administrative law and combined theoretical and practical knowledge. Orientation in relevant documents as well as a choice of material for terminological research is easier for specialist in public administration. Our research was accompanied by unwillingness, feigned busyness, and in some cases incompetence of specialists, so we had to help ourselves.

4. Key research outcomes and findings

We used textual and socioterminology approaches closely related to translation terminology. We were inspired by methodology and basic terminological terms (the Pavel terminology tutorial – glossary) available on online Canadian TDB Termium[1)]. All proposals are based on the existing praxis, methods, standards and types of users in a culture and running Canadian TDB Termiun. We also tried to propose the supplemented draft and comprehensive methodology for formation of the bilingual terminological glossary of public administration. We proposed using a context in terminological work as an important example of using a non-uniformed public administration term in specialized text of a different level of specification.

[1)] the Government of Canada`s terminology and linguistic data bank. Available at: http://www.termium.com/ [online]. [cit. 2011-01-20].

Furthermore we implemented innovative methodological approaches by using empirical methods such as observation, talks and questionnaires, then theoretical methods such as hypothesis, comparative analysis, synthesis, documentation, excerption and concretization. Other outcomes of the research are methodological approaches towards the given interdisciplinary issue, processes within terminological work, terminological management and innovative proposal of the terminological record and entry in terminological dictionaries within the practical oriented terminography.

Another scope of our interest in the research part were particularities of public administration terminology, building graphic PA conceptual system in Slovakia, (Fig. 1/Fig. 1/Eq.), formal representation of conceptual system[2)], (Fig. 2/Fig. 2/Eq.), interdisciplinary concepts and dividing the thematic field into subdisciplines. The PA classification was based on a scientific literature and official websites of the Office of Government. Searching for such materials was very difficult because the topic of public administration is not included in thesaurus and structure models and

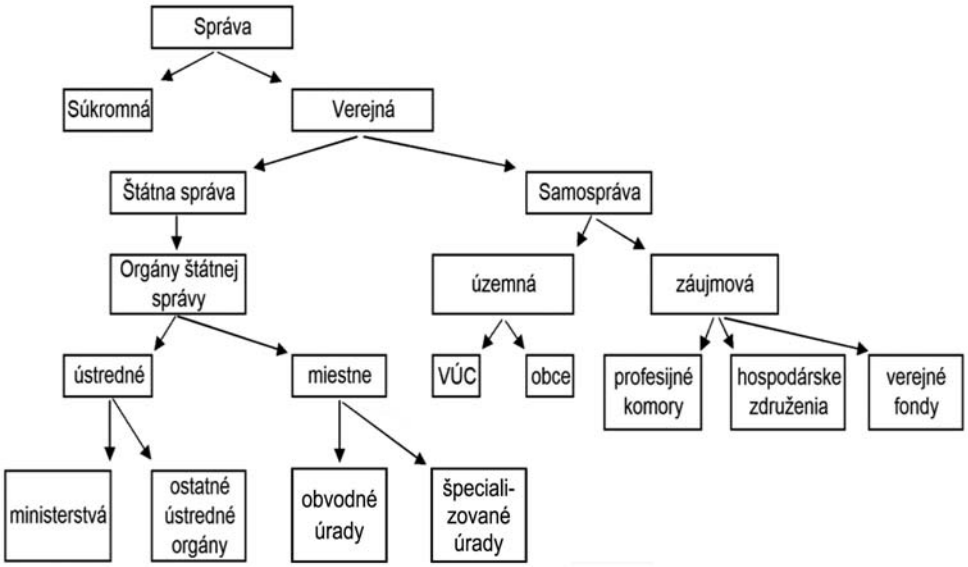

Fig. 1 Conceptual system of Slovak Public Administration. Tree diagram (the author's own source)

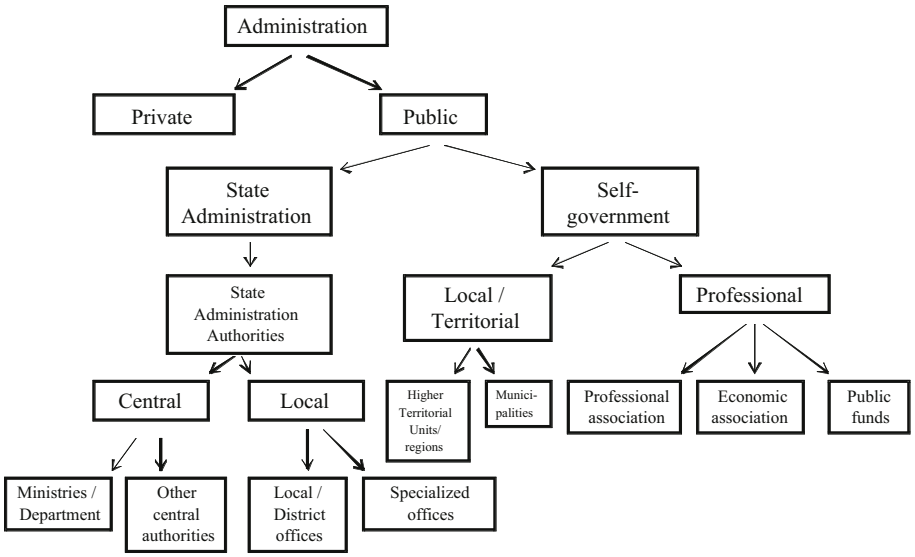

Fig. 1/Eq. Conceptual system of Slovak Public Administration with English equivalents. Tree diagram (the author's own source)

[2)] ISO 704 STN 01 0013: 2005 Terminologická práca. Princípy a metódy. Terminology work. Principles and methods.

public administration organization by different authors were often changed during reformation. The author compared not only English public administration conceptual systems but also some selected European ones for better historical and sociocultural understanding of differences and similarities.

PA terminology subdisciplines:

1. *Political-legal environment, abbr. - ple.* (constitutional law, human rights, administrative law, criminal law, etc.),
2. *Social-legal environment, abbr. - sle.* (municipal law, social security law, labour law, family law, law of domestic relations),

Economic-legal environment, abbr. - ele. (civil law, business (commercial) law, economic law etc.).

```
1. Sprava
  1.1 Sukromna sprava
  1.2 Verejna sprava
    1.2.1 Statna sprava
    1.2.2 Samosprava
      1.2.1.1 Organy statnej spravy
        1.2.1.1.1 Ustredne
          1.2.1.1.1.1 Ministerstva
          1.2.1.1.1.2 Ostatne ustredne spravy
        1.2.1.1.2 Miestne
          1.2.1.1.2.1 Obvodne urady
          1.2.1.1.2.2 Specializovane urady
      1.2.2.1 Miestna (uzemna) samosprava
        1.2.2.1.1 Obce
        1.2.2.1.2 Vyssie uzemne celky (VUC)
      1.2.2.2 Zaujmova samosprava
        1.2.2.2.1 Profesijne komory
        1.2.2.2.2 Hospodarske zdruzenia
        1.2.2.2.3 Verejne fondy
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Fig. 2 Formal representation of Slovak Public Administration conceptual system (the author's own source)

```
1. Administration
  1.1 Private Administration
  1.2 Public Administration
     1.2.1  State Administration
     1.2.2  Self-government
       1.2.1.1 State Administration authorities
         1.2.1.1.1 Central
           1.2.1.1.1.1 Ministries/Departments
           1.2.1.1.1.2 Other central authorities
          1.2.1.1.2 Local
            1.2.1.1.2.1 Local/District offices
            1.2.1.1.2.2 Specialized offices
       1.2.2.1 Local/Territorial self-government
         1.2.2.1.1 Municipalities
         1.2.2.1.2 Higher Territorial units/Self
                   -governing regions
       1.2.2.2 Professional self-government
         1.2.2.2.1 Professional association
         1.2.2.2.2 Economic association
         1.2.2.2.3 Public funds
```

Fig. 2/Eq. Formal representation of Slovak Public Administration conceptual system with English equivalents (the author's own source)

In the research part we also created the innovative terminological record and the structure of the bilingual concept-oriented terminological dictionary. One or more contexts – as a textual match – were included which helped the term delimiting for special communication situations and specific usage. We dealt with comparative analysis of concepts, terms, definitions and contexts to find out preferred equivalents. We oscillated between generic and specific terms and described them. Finally we established future users consist predominantly of translators, interpreters, undergraduates, postgraduates, specialists and general public.

We try to widen the J. Vilikovsky's [27] (1984, pp. 32–37) definition of equivalence "as a means of expression or set of ones which stands in another language as a functional replica of context relevant information presented in original text, while preserves its invariantness and lean on ideological, period, local and sociocultural context and users consensus"[2].

5. Recommendations for practice

- to use only concept oriented terminology,
- to apply systematic, descriptive terminological management for documenting commonly used terms,
- to use textual and socioterminological approach in terminological work,
- to accept synonyms and social variants,
- to establish field scientific boundaries and divide them into subdisciplines,
- public administration terminology educates by its national originality,
- to use context as a textual support, describe a textual match in a terminology record and glossary that provides information about the semantic features of a concept or the use of a term,
- to practice team cooperation (linguists/terminologists, specialists),
- by using terminological methods, team management and comparative analysis try to specify term acceptability rating,
- to maintain internationality for better understanding,
- to maintain folksiness to integrate into sovereign nations,
- to come out from original terms as a part of history.

6. Conclusion

The research outcomes are useful in the process of translation, in the field of translation didactics and are useful for specialists who create and decode texts and documents written in a foreign language. Computer aided conceptual oriented terminology with examples functioning in specialized, cultural, social and historical context can enrich the knowledge gained in a field, can reflect changes and make thinking in concepts more actual in the developing field.

It is pointed out that not only the cognitive but also textual and social aspect of terminological analysis is essential for the process

of equivalentation and translation. What we considered as the most difficult was verifying the use correctness of the term in sociocultural environment, term acceptability rating and its acceptance by specialists.

In terms of Tereza Cabre's quotation [1] we agree with the statement that also public administration "terminology becomes a standard in multilingual communication and a guardian of cultures" and it is confirmed in our research. In the effort to intensify the specialists and terminologists team cooperation we organize scientific conference *Terminologicke forum* every two years.

We suggest to include terminological work into university foreign language teaching. We also pointed out the need of improving terminological literacy level and terminological culture in university language teaching and lifelong education. We proposed the solving of terminology and terminography education through the Slovak government regulations and state language policy.

We revealed and confirmed variants, ambivalence, interdisciplinary polysemy and synonymy in public administration terminology. It is impossible to speak about totally stable terminology in the future because just political changes and never ending reforms continuously influence public administration terminology which is in large measure predetermined by historical and cultural origin. The socioterminological approach was proved and also indicates the way. The social sciences terms are approximative, it is usual that the describing of the concept and the conceptual system is open to interpretation and convention.

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Danica Gondova *

THE DEVELOPMENT OF SPEAKING SKILLS IN ENGLISH LANGUAGE LESSONS

The paper deals with the importance of teaching speaking skills in foreign language lessons and it compares theoretical backgrounds and objectives of language teaching with the reality observed at some primary and lower-secondary schools and gymnasia in the Zilina Region. It also presents the results of the research which prove that in the observed lessons, speaking skills were not developed sufficiently.

Key words: *speaking skills, language habits, explicit knowledge, implicit knowledge, proceduralization, traditional techniques, learner-oriented activities.*

1. Introduction

This article draws on the principles of teaching and learning foreign languages and on the proceduralization of explicit language knowledge – the process that learners need to go through in order to develop the communicative competence. In the research carried out in primary and secondary schools in the Zilina Region in Slovakia, we investigate if the classroom communication enables learners to proceed from gaining explicit language knowledge through gaining language habits to finally gaining implicit language knowledge which enables them to use language structures automatically in productive creativity. In this process of proceduralization, learners achieve the communicative competence which is the objective of language learning.

2. Communicative Competence and Its Objectives

The learner who achieves the communicative competence is able to use appropriate language in a given context of use, and has mastered a range of language structures and their functions ([6], p. 131). The communicative competence is usually defined in categories of four sub-competencies ([3], p. 147):

a) grammatical competence
b) sociolinguistic competence
c) discourse competence
d) strategic competence

In the Common European Framework ([2], p. 13), the sub-competences of the communicative competence are defined in terms of the linguistic, pragmatic and socio-linguistic competences. The linguistic competence includes "lexical, phonological, syntactical knowledge and skills and other dimensions of language as system, independently of the sociolinguistic value of its variations and the pragmatic functions of its realisations" ([2], p. 13). It is emphasised that "this component... relates not only to the range and quality of knowledge... but also to cognitive organisation and the way this knowledge is stored... and to its accessibility (activation, recall and availability)" ([2], p. 13). In other words, the learners need to gain not only the language knowledge, but also the strategies which are needed so that they become independent learners and independent users of the target language. The strategies also help them gradually turn the explicit knowledge of language structures into implicit knowledge which is readily available whenever needed.

Learners' communicative competence is further demonstrated through their socio-linguistic competence, which means that learners are able to respect social conventions in various social environments and communities. The pragmatic competence is "concerned with the functional use of linguistic resources (production of language functions, speech acts), drawing on scenarios or scripts of interactional exchanges. It also concerns the mastery of discourse, cohesion and coherence" ([2], p. 13). In this context, "the impact of interactions and cultural environments in which such abilities are constructed" ([2], p. 13) is of significant importance.

Achieving communicative competence is the objective which is stipulated in the Zakon o vychove a vzdelavani c. 245/2008 Z. z. ([13], p. 11), the document valid for all primary and secondary schools. The new educational law stresses the fact that the language is the means of thinking and communication among people and therefore, the process of learning a language should focus on the development of communicative competences. The main emphasis is placed on the productive creativity, which means that learners

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should be encouraged to use the language creatively to express their own ideas, opinions, arguments or feelings.

3. Achieving Communicative Competence in School Conditions

In the light of the development of the communicative competence, we believe that effective language learning techniques are those which enable learners to achieve the objectives stipulated in the educational law, i.e. all components of the communicative competence. Language learning moves from declarative, explicit knowledge (such as grammar rules, grammatical forms, vocabulary) to its proceduralization (gaining implicit knowledge), i.e. the ability to use the language automatically and creatively when needed. Gaining declarative or explicit knowledge of language systems has definitely its meaning when the language is studied in school conditions because the language classroom is often the only space where the learner has the opportunity to encounter the target language. However, explicit knowledge is not sufficient, and it is also necessary to provide learners with opportunities to change their explicit knowledge into implicit through giving them space for multi-dimensional interaction so that they can gain language habits and subsequently secondary language skills ([5], p. 35) and competences. These are achieved in the process of proceduralization in which the explicit knowledge is changed into implicit, procedural knowledge.

It is also necessary to realize that in order to be taught language explicitly, learners need to be cognitively mature. Therefore, the younger the learners the less appropriate cognitive teaching is. It is generally accepted that at the primary level learners should acquire language, not learn it consciously. On the other hand, explicit teaching might be of great importance for adult learners, including upper-secondary students, whose cognitive thinking has been developed. Even though explicit learning might be helpful, having gained the explicit knowledge learners should be given adequate space to proceduralize the explicit knowledge in meaningful, communicative tasks. We would like to emphasize that it is not sufficient to let learners practise new language structures at sentence level in various grammatical exercises included in coursebooks. Learners also need to practise them in speaking tasks such as oral drills, or tasks including an information gap [11] which are meaningful and personalized. These tasks should be done in pairs or in small groups so that multi-dimensional communication is possible and the learner talking time is increased.

According to ([7], pp. 53–54) teachers in Slovakia proclaim that they use communicative tasks, but the results of her research prove that they put much more emphasis on declarative knowledge and they overestimate it. On the other hand, the learners express dissatisfaction with the fact that their secondary skills are not developed sufficiently. ([10], p. 58) achieved similar results in her research when she found out that students achieve better results in discrete-item tests than they do in language in-use-tests even though their teachers claim that they use communicative tasks in the teaching process.

4. Kinds of Techniques and Activities

In the 1960s, ([9], p. 3) divided techniques used in language teaching into manipulative and communicative. According to him, manipulative techniques are those in which the learner receives all the language from the teacher, the book or the cassette and his only task is to reproduce it. On the other side of the continuum, there are tasks which enable learners to use words and structures that they themselves choose, which means they also have to control meanings of their utterances.

At present, the techniques are divided in a similar way [1, 4, 12]. The most important aspect is considered to be the level of language control by the teacher. On the one side of the continuum there are controlled techniques, often referred to as accuracy-oriented or systems-oriented techniques. The questions a learner is asked to answer or to respond to are all display questions ([1], p. 171) to which the answer is known in advance. These techniques usually focus on the correct form of the target structure, not on its use. They are teacher-oriented and highly structured. Learners' responses are predictable and the teacher's role is mainly that of a controller who controls not only what happens in the lesson, but also the language learners are asked to use.

Through predominantly controlled techniques and afterwards predominantly free techniques, learners proceed to the other side of the continuum to the techniques that are referred to as skills-oriented or fluency oriented techniques. Their main focus is the meaning and message of the communication. The questions are referential questions ([1], p. 171) and therefore, the language learners produce is not predictable. For this reason these techniques are considered to be communicative. The freer the language enabled by a technique the more learners can proceduralize their knowledge and gain secondary skills and communicative competence.

5. Research Objectives

This article is based on a larger research which we carried out from January 2010 till November 2010 and whose main objective was to find out if teachers at primary and secondary schools in the Zilina Region use techniques that lead to developing language habits and language skills, in other words techniques which are not controlled and which enable learners to produce language to express their own ideas, opinions and feelings. We observed forty five English lessons taught by fifteen English teachers (three lessons each) at primary, and lower and upper secondary schools (five teachers at each level).

For the purposes of our research we differentiate three groups of techniques which reflect the three above mentioned stages of language learning:

a) techniques helping learners gain explicit knowledge
b) techniques helping learners gain language habits
c) techniques helping learners gain secondary skills.

In addition to that, within each of the groups we differentiate between traditional techniques and activities. We understand the traditional techniques as those which are teacher-oriented and done with the whole class. They do not allow independent, productive work of learners and do not allow productive creativity. On the other hand, activities are those tasks which enable learners to work independently from the teacher, and produce language to express their own ideas, feelings and opinions; they also make multi-dimensional interaction possible, and make learners think productively at all stages of language learning.

6. The Speaking Skills of Primary and Secondary School Learners

The main focus of this study is to discuss if the techniques and activities which we observed in the forty five lessons enable learners to gain speaking habits and secondary speaking skills, i.e. the skills which make it possible for them to speak the target language spontaneously, without too much thinking and too many hesitations, and without too much searching for words or sentence structures. Such techniques and activities support productive creativity and thus help learners achieve communicative competence.

As mentioned above, we observed English teachers teaching at three stages of schools. According to the new educational law [13] primary learners are supposed to achieve A1 level of the CEF ([13], p. 23), which means that they should be able to "produce simple mainly isolated phrases about people and places" ([2], p. 58). At the end of the lower secondary education, the learners should achieve at least A2 level of the CEF ([2], p. 23) and should be able to "give a simple description or presentation of people, living or working conditions, daily routines, likes/dislikes, etc. as a short series of simple phrases and sentences linked into a list" ([2], p. 58). Even though these two groups of learners are not expected to communicate freely or to produce a sustained monologue, they should be able to at least answer simple referential questions and have gained some language habits.

The third group of learners in our research includes Gymnasium students whose objective is to achieve B2 level. As to the speaking skills, the B2 learner is expected to "give clear, detailed descriptions and presentations on a wide range of subjects related to his/her field of interest, expanding and supporting ideas with subsidiary points and relevant example" ([2], p. 58). At B2+ level, the learner can "give clear, systematically developed descriptions and presentations, with appropriate highlighting of significant points, and relevant supporting detail" ([2], p. 58). In addition to that, the learner should also be able to "develop a clear argument, expanding and supporting his/her points of view at some length with subsidiary points and relevant examples" ([2], p. 59). In order to be able to do that, the learner must have a good command of secondary skills and strategies that lead to the mastery of a foreign language. Therefore, the learner must have not only been exposed to a variety of language input, but must also have had ample opportunities to practise language freely and creatively.

7. Taxonomy of Techniques and Activities

In order to be able to observe what happens in the lessons we worked out a taxonomy of techniques and activities on the continuum of controlled (accuracy-oriented) to free (fluency-oriented) techniques and activities. The controlled side of the continuum includes mostly techniques, whereas the free side of the continuum includes mainly activities. Before we carried out the actual research, we observed fifteen classes and worked out the taxonomy used in the research.

The observed categories were divided into four groups:

a) classroom management
b) controlled techniques and activities enabling gaining explicit knowledge;
c) semi-controlled techniques and activities enabling gaining language habits;
d) free techniques and activities enabling gaining secondary skills.

In the first group we included the time teachers spent on managing the class, e.g. doing the register, organizing learners, giving instructions or recording the results of learners' work. These do not contribute to the development of learners' language skills directly, but are a necessary part of the teaching process.

The second group consisted of accuracy-focused techniques and activities whose main objective was for learners to learn or acquire language structures or vocabulary items, or to practise pronunciation. Most of the whole-class techniques were 'heads-down' activities, which means learners were doing exercises from the course-book and writing the answers in them. They also included a lot of techniques where learners were asked to translate the English texts or exercises into Slovak and afterwards produce the answers. Using techniques teachers applied direct teaching strategies and explicit knowledge was taught deductively. On the other hand, the activities included in this group focused on teaching grammar or vocabulary inductively. They also included games which help learners remember new words or grammatical structure more easily. There is only one technique in this group which focuses on speaking directly and that is a (meaningful) drill done as a whole class task. It requires learners' oral response to a visual prompt or some information they get (e.g. flash cards, replacing words in sentences).

The third group includes mainly activities which stimulate learners to use language more independently in various problem-solving tasks, situational dialogues, meaningful drills, surveys, interviews, rehearsed role-plays, simulations or games. The objectives of these activities focus on practising target structures or vocabulary in meaningful, communicative activities done in pairs or in small groups. We have only included a few semi-controlled techniques in this group, such as retelling a story, or a monologue; a talk, description, or dialogue performed in front of the whole class after having rehearsed their performances in groups or in pairs. Most of these techniques or activities require oral or written production of language which is controlled only partly.

The last group includes those activities in which learners use the target language freely to express their own ideas and opinions or to talk about their own experiences. They include such activities as brainstorming, group discussions, debates, problem-solving tasks, prediction tasks, projects, unrehearsed role-plays, interviews, surveys, icebreakers, etc. We also included some traditional techniques in this group, such as a whole-class discussion or interview led by the teacher. When doing the tasks included in the third group, learners gain the experience of practising a variety of speaking sub-skills, such as producing long and short turns in the interaction, turn-taking, negotiating the topic, keeping the conversation going, starting and terminating the turn, initiating the conversation, using discourse markers and conversational fillers, etc. ([1], p. 277).

8. Research Results

The results of the research show that the observed teachers paid very little attention to developing learners speaking skills. Primary teachers had fifteen lessons at their disposal, but they only taught 14 lessons and ten minutes (they started the lesson later or finished earlier than they were supposed to). Out of this time, 6 minutes 44 seconds were spent on drills (group 2), and during another 21 minutes 46 seconds, teachers asked individual learners to produce a short talk, description or dialogue without giving them a chance to prepare for it in a small group before. That means the learners spent 4.5% of the classroom time they had at their disposal to develop their speaking habits. It is necessary to stress though, that these were all techniques which means that only one learner was talking at a time and everybody else was just listening to him/her without actually having any reason to listen because no task was set.

Speaking was practised even less at lower-secondary schools. Learners spent 9 minutes 35 seconds doing whole-class drills; during another 1 minute 50 seconds, some of them were producing a talk or a description; and during another 8 minutes 57 seconds, teachers were asking referential questions to the whole class. All in all, the duration of the teaching time was 14 lessons and 32 minutes, 48 seconds; and out of this time, 3.07% was spent on techniques which required speaking from learners. The observed teachers teaching at primary and lower secondary schools did not use any activities and did not encourage any multidimensional communication in pair or group activities.

At upper secondary schools, we also video-recorded 15 lessons; and the teachers used 14 lessons, 27 minutes, 38 seconds to teach. Out of this time, learners spent 2 minutes 2 seconds doing drills; 52 minutes 52 seconds answering teacher's referential questions asked to the whole-class; another 10 minutes 55 seconds talking, describing or producing a dialogue in front of the whole class without having any opportunity to rehearse it in a small group before. In other words, 10.01% of the allocated time was spent doing speaking tasks which, however, were teacher-oriented. That means some learners had the opportunity to try and say something, the others did not develop their speaking habits because they were just listening.

Upper-secondary school learners were also involved in some speaking activities: in some lessons learners were asked to work in pairs and do meaningful drills during 5 minutes, 9 seconds; they spent another 5 minutes 46 seconds discussing a fictitious situation in pairs or in small groups, and another 4 minutes, 29 seconds discussing a real situation in pairs or in small groups. In this way, these learners spent additional 2.34% of the allocated time practising speaking and gaining speaking habits.

Out of 15 observed upper secondary school teachers, one asked students to brainstorm ideas – an activity that lasted for 85 seconds and subsequently, they were asked to discuss a topic in groups of three people using any language they could and expressing their ideas on the topic. These were the only two activities which enabled learners to practise their secondary speaking skills. These activities took 2 minutes 25 seconds, which is 0.58% of the overall time spent on free communicative activities in which students can develop their speaking skills.

Altogether, in the observed lessons, learners spent 0.93% of the time doing teacher-oriented drills; 3.18% answering teacher's referential questions in a whole-class task; 1.75% doing another teacher-oriented task – describing something, talking about something or performing a dialogue in front of the whole class. Only upper-secondary learners were asked to work in pairs or in small groups to practise speaking in order to gain speaking habits. These activities took 0.78% of the overall time of the observed lessons. Free speaking lasted for only 0.2% of the overall time.

As we have already mentioned above, we observed 45 English lessons. The real time of the lessons taught was 117,266 seconds, which was 43 forty-five-minute lessons, 19 minutes, 43 seconds. Out of this time, only 6.84% of the time was spent on practising speaking.

9. Discussion

At present, "language teaching is being shaped by several important ideas. First, the shift toward a cognitive paradigm means that learning has taken precedence over teaching. What the student learns is the important outcome of the teaching-learning process, not what the teacher teaches" ([8], p. 379). Learners learn much more if they can do things themselves and this is particularly true about learning skills. One cannot master a skill without trying it out, practising it and improving it consistently.

The research shows that when teaching English, the observed teachers direct their attention, as well as the attention of their learners, to the development of the learners' linguistic competence, emphasizing teaching mainly grammar and vocabulary. Teaching pronunciation is not the focus of their attention. A lot of attention is also paid to reading, particularly to reading unknown texts aloud. Most teachers use mainly direct teaching strategies, and most of the teaching we observed was up-front teaching with teachers doing a lot of talking, very often in Slovak. Because the ratio of teacher talking time was very high in comparison to student talking time,

students had very few opportunities to speak and learn from speaking.

The issue of the value of teacher and student talking time is very complex. Learners need to be given opportunities to produce language in real time interactions in order to be able to acquire speaking sub-skills such as those mentioned above: producing short and long turns in conversations, taking turns, negotiating a topic, keeping the conversation going; producing talks in various situations, etc. In addition to that, when they speak they are given opportunities to notice their own mistakes and learn from them to be able to develop their interlanguage. This did not happen in the observed lessons because learners did not have sufficient space to practise speaking, and most of the speaking activities we could observe included short answers to teachers' questions.

As we have mentioned above, A1 and A2 learners are not expected to produce much spoken language independently, yet they should be able to answer teacher's questions about their families, places of living, likes and dislikes, or everyday experiences. At A2 level they should also be able to produce simple descriptions and a sustained monologue. In the lessons they should practise these in various situational dialogues, role-plays, interviews or simulations. However, in real life the observed learners only answered teacher's display questions and the speaking tasks they did were usually not learner-oriented and therefore only one or two people could speak during that time. What we found very surprising was that the observed teachers at primary and lower-secondary schools used only very few games and meaningful drills, and did not use any situational dialogues, role-plays, or simulations which might make it possible for children to acquire some speaking skills. Instead, children spent most of the time doing grammar and vocabulary tasks, and in many cases they had to 'digest' quite a lot of metalanguage to be able to do the required grammatical tasks.

The situation is not better in the observed lessons in gymnasia either. The observed teachers spent most of the time doing traditional, whole-class tasks without giving learners opportunities for productive creativity, i.e. expressing their own ideas, opinions, arguments, etc. This happens despite the fact that at B1-B2 levels learners are expected to produce quite a lot of spoken language in interactions spontaneously. We believe that this is one of the reasons why students can perform fairly well in written tests, but their speaking skills are below the required level.

The research results illustrate that the learners at the observed schools have very few opportunities to practise speaking, which necessarily means that they do not gain any speaking habits, or speaking skills. Moreover, in most cases the output they produce is very restricted and they are not given a chance to develop their procedural knowledge in productive, creative tasks. We believe that giving learners opportunities for productive creativity is a necessary pre-condition of gaining the communicative competence which is the objective stipulated in the new educational law.

In addition to the observations we also carried out interviews with all the observed teachers to find out how they understand the teaching/learning process and how they perceive what happens in their classrooms. The observations revealed that teachers do not give learners sufficient space to develop their speaking skills, but despite that teachers consider speaking and the ability to communicate as the most important part of foreign language learning. They also emphasise the necessity for the learners to gain communicative competence. Eight of the observed teachers believe that in their lessons, learners have sufficient space to practise and develop their speaking skills; two teachers believe that the space is rather limited, and five teachers admit that it is not sufficient. Eleven teachers claim that their learners are not interested in developing their speaking skills and when they are asked to work in pairs or in small groups, they usually speak Slovak.

The teachers' answers also revealed that most of them are familiar with the principles of the learner-oriented approach to language teaching, but are not ready to give up their role of a controller. Some of them do not know how speaking skills can be practised through accuracy-oriented activities at low levels of language proficiency, and fluency-oriented activities at higher levels of language proficiency. Despite the fact that the communicative approach to language teaching/learning has existed for about forty years, most of the observed teachers still rely on the grammar-translation method. Surprisingly, this is true not only for all unqualified English teachers, but also for those who have the required qualifications.

We believe that learners' skills will not improve if English becomes a compulsory subject and will be taught from Year 3 at primary schools. On the contrary, if it is taught in the way we could often observe in the 45 lessons, learners will not understand the communicative function of the language; they will not perceive it as a means of communication, but only as another school subject. Instead of developing speaking skills, they will develop inhibitions and will not be confident about using the target language. We believe that in order to achieve the objectives of the latest school reform it is necessary to change teachers' perception of and their approach to foreign language teaching.

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Zdena Kralova *

A PROBE INTO THE EXTRAVERSION AND L2 PRONUNCIATION RELATIONSHIP

The study assessed the relation between the overall degree of the perceived foreign accent in non-natives' English speech and some personal variables which include global factors (extraversion, anxiety, tough-mindedness, independence, self-control) and contributing primary factors, extraversion being the focus of our attention. Five native speakers of English were asked to auditorily evaluate the samples of free English speech produced by each of 75 non-native speakers using the equal-appearing interval 5-point scale. The 10-point scale was used to rate each of the personality variables for non-native speakers and the interclass correlation coefficients were calculated to identify the relevant predictors of L2 pronunciation quality.

Key words: *L2 pronunciation, personality factors, correlation*

1. Introduction

In this paper we introduce a project which aims to provide a comprehensive examination of personality variables in the pronunciation of a second language (L2). The study focuses on describing the first step of the experiment (pre-test). In order to understand which personality dimensions are crucial to L2 pronunciation learning, this study attempts to determine whether they correlate significantly to L2 pronunciation quality. Particular personality dimensions of the subjects are measured with a standardized questionnaire, and L2 (English) pronunciation quality is auditorily evaluated by English native speakers. We examined how the personality traits are correlated with pronunciation assessment scores, focusing on the global factor Extraversion. The complete research adds a longitudinal perspective in considering to what extent the effect of the extraversion/introversion dimension on learners' foreign language pronunciation remains stable over time.

Due to the exploratory nature of this preliminary study and the inconsistency of previous research findings, we proposed a null hypothesis for the research question "Which personality factors correlate significantly with L2 pronunciation quality?" – to the effect that "There is no relationship between the degree of extraversion and L2 pronunciation quality." Though L2 teachers and learners widely conceive extraversion/introversion as an obvious factor in L2 acquisition and there is a growing acceptance within the second language learning (SLA) community of learners' feelings and reflections within the learning process [1], the number of linguistic studies including psychological variables is relatively limited. The researchers investigating the effect of extraversion on L2 oral production mostly discovered no systematic relationship. An intuitive feeling about the relationship between an outgoing personality and second language learning is no sufficient evidence on which to base a theory of teaching and learning, so this study tried to contribute to the investigation of this intriguing topic.

2. Methodology

Seventy-five (55 female and 20 male) native speakers of Slovak served as tests subjects examined in the study. They were Slovak first-year university students enrolled in the English Language and Literature course at an upper-intermediate level of English proficiency. They shared an additional number of variables such as age (range: 18–19 years), age of onset of L2 (English) learning (6–7 years) and experience/training in this L2 (the same type of English instruction in the formal setting of Slovak schools with a focus on grammar-based instruction, comparable amounts of experience in English-speaking environments).

Five native English control subjects (3 American – 2 male [I, II], 1 female [III]; 2 British – 1 male [IV], 1 female [V]) were asked to auditorily evaluate the English texts produced by each of the 75 speakers using the equal-appearing interval 5-point scale (5 – very good pronunciation; 1 – poor pronunciation). The raters were English native speakers more or less experienced in ELT (English language teaching) who had lived in Slovakia for several months. As none of the participants were professional linguists, major differences in theoretical knowledge especially about English phonetics were improbable. An average rating was obtained for each speaker and the variable "English phonic competence" (EPC) was com-

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puted by averaging across each rater's score. These assessments were correlated with the results of the psychological test.

Pronunciation samples (a free, extemporaneous talk in English) were recorded on a recorder with a condense microphone for further analysis and reference. Spontaneous speech is by definition the most natural form of speech and certainly reflects overall abilities the best, allowing especially representative impressions of fluency, speaking rate, choice of words, choice of prosodic patterns and segmental realizations. At the start of each recording session, speakers were asked to introduce themselves and talk about their families. This monologue was then extended into a short conversation with the instructor, resulting in about 5 minutes of quasi-spontaneous speech altogether. Due to the laboratory situation in a classroom at the University of Zilina, the speech production can, of course, not be called completely spontaneous, therefore we term these tasks quasi-spontaneous.

We applied a questionnaire that aims to determine whether certain personality characteristics correlate with the L2 pronunciation quality of non-native speakers. The test assesses personality traits according to major factors, namely five global factors (extraversion, anxiety, tough-mindedness, independence and self-control) and sixteen contributing primary factors (warmth, reasoning, emotional stability, dominance, liveliness, rule-consciousness, social boldness, sensitivity, vigilance, abstractedness, privateness, apprehension, openness to change, self-reliance, perfectionism and tension) (Table 1). In order to elicit the information concerning personality from the participants, we used the 16-factor personality questionnaire [2] which took 50 minutes to complete. The test computes an individual's degree of sixteen personality factors contributing to five global factors by means of self-reported answers to 185 multiple-choice questions. An adult can score between 1 and 10 on the factor scale. The higher the score on the items of the questionnaire scale, the more the subjects tend towards the given personality trait. The administrator of the personality questionnaire was a psychologist (see Acknowledgements). The questionnaire was processed using the software Psychosoft System Brno which provided automatic scoring and interpretation. Due to space limitation, the questionnaire cannot be fully discussed here.

Relying on the data most frequently presented in research papers and theoretical discussions, we aimed at investigating the possible influence of the extraversion upon the pronunciation accuracy observed in the interlanguage of learners of English as a foreign language. The data were collected, then evaluated and the indivi-

Global factors [2] Tab. 1

Global Factors			
*Global Factors Definitions**	*Contributing Primary Factors*		
Extraversion Social orientation; the desire to be around others and be noticed by them; the energy invested in initiating and maintaining social relationships.	A Warmth	A− Reserved	A+ Warm
	F Liveliness	F− Serious	F+ Lively
	H Social Boldness	H− Shy	H+ Socially Bold
	N Privateness*	N− Forthright	N+ Private
	Q2 Self-Reliance*	Q2− Group-Oriented	Q2+ Self-Reliant
Independence The role a person assumes when interacting with others; the extent to which they are likely to influence or be influenced by the views of other people.	E Dominance	E− Deferential	E+ Dominant
	H Social Boldness	H− Shy	H+ Socially Bold
	L Vigilance	L− Trusting	L+ Vigilant
	Q1 Openness to Change	Q1− Traditional	Q1+ Open to Change
Tough-Mindedness The way a person processes information; the extent to which they will solve problems at an objective, cognitive level or by using subjective or personal considerations.	A Warmth*	A− Reserved	A+ Warm
	I Sensitivity*	I− Utilitarian	I+ Sensitive
	M Abstractedness*	M− Grounded	M+ Abstracted
	Q1 Openness to Change*	Q1− Traditional	Q1+ Open to Change
Self-Control Response to environmental controls on behaviour; internal self-discipline.	F Liveliness*	F− Serious	F+ Lively
	G Rule-Consciousness	G− Expedient	G+ Rule-Conscious
	M Abstractedness*	M− Grounded	M+ Abstracted
	Q3 Perfectionism	Q3− Tolerates Disorder	Q3+ Perfectionistic
Anxiety Emotional adjustment; the types of emotions experienced and the intensity of these.	C Emotional Stability*	C− Reactive	C+ Emotionally Stable
	L Vigilance	L− Trusting	L+ Vigilant
	O Apprehension	O− Self-Assured	O+ Apprehensive
	Q4 Tension	Q4− Relaxed	Q4+ Tense

− = limit value 1, 2, 3 Average = 4, 5, 6, 7 + = limit value 8, 9, 10

* indicates a negative relationship between the Global and Primary Factor

dual scores of the respective test parts were analysed in descriptive statistics. It was felt more appropriate at this pilot stage of the research to limit the report to first level statistical analysis – simple correlation alone. The variables were submitted to a simple correlation analysis. The interclass Pearson correlation coefficient (r) was calculated to identify which personality factors are significant predictors of L2 pronunciation quality. The correlation coefficient was calculated by applying the scoring coefficients generated by the principal component analysis to standardized values for subjects' responses. The variables were correlated with the total pronunciation rating and the correlation coefficients were obtained. The result is statistically relevant for the phenomena with the correlation coefficients higher than the critical values for the variable length 75 on the 0.05 level = 0.1850 (Pearson's correlation). For lower values the correlation is not evident, the negative value indicates inverse proportion. The closer is the value to 1.0, the stronger is the correlation between the variables.

3. Results

Pronunciation rating Tab. 2

Student	[I]	[II]	[III]	[IV]	[V]	MEAN
1	4	2	2	2	3	2.6
2	4	4	3	3	2	3.2
3	2	2	2	2	2	2
4	3	2	2	2	2	2.2
5	3	2	1	2	2	2
6	2	1	2	1	2	1.6
7	3	2	2	3	1	2.2
8	3	3	2	3	1	2.4
9	2	2	2	2	1	1.8
10	2	2	2	3	2	2.2
11	3	2	2	2	2	2.2
12	2	2	2	1	1	1.6
13	3	3	4	4	4	3.6
14	4	3	3	3	4	3.4
15	3	2	3	3	2	3.2
16	3	3	2	3	3	2.8
17	3	3	3	2	3	2.8
18	2	2	2	2	2	2
19	3	2	2	2	1	2
20	2	1	2	1	2	1,6
21	3	3	2	3	2	2.6
22	5	3	5	5	4	4.4
23	1	2	2	2	1	1.6
24	2	3	3	3	2	2.6
25	2	2	2	2	1	1.8
26	3	3	2	3	3	2.8
27	3	3	2	3	3	2.8
28	2	2	2	2	2	2
29	4	4	3	3	3	3.4
30	4	3	3	3	3	3.2
31	2	2	2	3	2	2.2
32	3	2	2	3	2	2.4
33	3	3	3	3	2	2.8
34	3	2	2	3	2	2.4
35	4	4	3	5	3	3.8
36	3	4	3	4	2	3.2
37	3	2	2	2	3	2.4
38	3	3	3	4	3	3.2
39	5	5	4	5	4	4.6
40	3	3	2	3	2	2.6
41	2	1	2	1	1	1.4
42	3	3	2	3	2	2.6
43	3	4	3	4	3	3.4
44	3	3	3	4	2	3
45	3	3	2	3	2	2.6
46	3	2	2	3	2	2.4
47	4	4	2	4	3	3.4
48	3	2	2	3	2	2.4
49	3	4	2	4	2	3
50	3	2	2	2	2	2.2
51	3	3	2	3	3	2.8
52	3	3	2	2	2	2.4
53	4	3	2	2	3	2.8
54	3	1	1	1	2	1.6
55	3	3	2	3	2	2.6
56	4	3	2	4	3	3.2
57	3	2	2	3	2	2.4
58	3	2	2	2	3	2.4
59	4	3	3	4	3	3.4
60	3	3	2	4	3	3
61	3	2	2	2	1	2
62	3	2	3	2	3	2.6
63	3	3	3	2	2	2.6
64	3	4	2	4	4	3.4
65	4	4	3	4	3	3.6
66	2	1	2	2	2	1.8
67	4	2	2	2	3	2.6
68	2	3	2	2	1	2
69	3	3	3	4	2	3
70	3	1	2	1	2	1.8
71	3	3	2	2	1	2.2
72	2	1	2	1	1	1.4
73	3	4	2	3	2	2.8
74	3	4	1	3	2	2.6
75	3	3	1	3	2	2.4
MEAN	2.99	2.63	2.28	2.75	2.25	2.59

Correlation of EPC and personality factors Tab. 3

Student	EPC	A	B	C	E	F	G	H	I	L	M	N
1	2.6	5	4	5	5	9	3	7	5	4	7	4
2	3.2	7	4	6	3	4	6	5	5	6	9	6
3	2	5	4	6	6	5	3	4	8	8	9	8
4	2.2	7	8	2	6	6	5	7	6	5	6	4
5	2	6	4	7	8	8	4	9	7	6	6	4
6	1.6	7	5	7	6	6	4	5	2	7	4	5
7	2.2	5	5	5	5	7	2	5	6	6	9	7
8	2.4	5	5	5	6	7	5	8	4	5	3	4
9	1.8	4	5	4	2	5	6	3	5	4	7	8
10	2.2	6	4	5	3	2	6	3	6	6	4	6
11	2.2	9	6	8	7	4	6	9	7	8	3	4
12	1.6	8	5	4	3	7	5	6	7	9	6	3
13	3.6	6	6	6	6	6	3	8	5	6	4	3
14	3.4	8	3	2	5	7	6	6	7	7	9	4
15	3.2	7	7	6	5	4	6	4	7	5	8	4
16	2.8	9	6	6	5	7	4	7	6	4	5	5
17	2.8	5	4	2	10	8	2	5	8	9	8	8
18	2	7	4	2	3	4	5	3	8	6	6	5
19	2	5	7	4	5	6	6	5	5	6	7	3
20	1,6	4	7	4	3	6	6	3	6	8	5	5
21	2.6	5	5	4	3	5	4	6	8	5	7	5
22	4.4	7	6	6	3	8	3	8	7	6	8	3
23	1.6	4	3	6	3	5	3	5	4	6	6	7
24	2.6	5	5	4	3	8	1	7	7	4	8	3
25	1.8	5	6	4	5	3	7	6	9	8	7	6
26	2.8	5	5	7	5	7	3	7	5	6	6	4
27	2.8	5	7	6	6	7	3	8	6	5	5	5
28	2	5	6	5	6	5	8	3	7	9	7	6
29	3.4	8	4	6	7	7	7	8	7	4	3	5
30	3.2	8	5	4	7	9	3	8	6	6	4	4
31	2.2	6	6	4	6	9	2	7	7	6	6	3
32	2.4	6	5	5	1	4	6	3	8	5	3	2
33	2.8	4	5	4	2	4	8	5	6	6	7	7
34	2.4	8	7	6	6	7	6	6	6	7	6	4
35	3.8	3	6	5	6	3	6	4	7	6	4	7
36	3.2	7	5	4	8	7	5	6	8	8	7	6
37	2.4	9	7	6	4	9	3	9	3	5	3	2
38	3.2	5	3	6	5	4	6	8	7	6	8	4
39	4.6	5	5	5	5	7	6	8	5	8	5	5
40	2.6	7	5	5	5	6	6	7	6	6	3	8
41	1.4	8	6	3	8	8	4	7	7	9	9	5
42	2.6	8	6	7	6	7	4	6	5	5	8	3
43	3.4	3	6	4	2	4	5	5	6	5	8	8
44	3	5	6	3	7	6	6	5	10	6	10	8
45	2.6	5	5	3	4	6	2	5	7	7	9	5
46	2.4	6	6	6	6	8	5	8	7	8	2	5

47	3.4	6	6	2	4	5	6	3	7	8	7	5
48	2.4	4	4	4	5	9	4	5	7	8	7	4
49	3	8	4	4	8	7	5	5	6	7	8	8
50	2.2	5	4	3	5	8	4	7	7	8	8	6
51	2.8	6	6	4	4	5	5	5	8	6	5	5
52	2.4	7	6	9	8	8	4	8	7	7	5	6
53	2.8	4	5	4	6	7	4	5	5	6	6	5
54	1.6	7	6	6	5	7	3	9	2	9	3	2
55	2.6	7	5	4	6	4	6	3	7	5	5	6
56	3.2	5	4	5	4	4	3	7	8	6	8	4
57	2.4	4	5	5	6	6	3	5	6	6	5	6
58	2.4	5	6	3	6	5	3	4	7	6	7	7
59	3.4	5	6	5	5	7	4	8	7	4	6	2
60	3	7	7	4	7	7	3	7	7	5	5	4
61	2	5	8	3	7	7	5	7	5	6	9	4
62	2.6	5	6	6	6	7	2	8	6	5	7	2
63	2.6	6	4	6	5	6	2	4	5	4	7	6
64	3.4	6	6	4	4	5	7	5	7	5	10	6
65	3.6	7	8	6	7	7	3	7	7	6	6	5
66	1.8	6	6	5	10	8	4	6	7	6	5	6
67	2.6	7	5	6	3	6	3	6	7	4	6	4
68	2	9	3	4	7	6	4	7	7	7	9	5
69	3	6	5	4	8	6	2	6	8	5	8	6
70	1.8	9	4	5	9	6	5	8	5	9	7	6
71	2.2	4	5	3	7	4	5	4	5	6	5	6
72	1.4	4	4	2	6	7	2	7	5	4	5	4
73	2.8	4	7	6	5	7	7	7	7	4	5	5
74	2.6	3	6	5	2	6	5	5	6	8	4	4
75	2.4	7	5	5	4	5	5	6	7	9	6	5
R		**−0.0219**	**0.0679**	**0.0778**	**−0.0702**	**-0.0209**	**0.0819**	**0.1296**	**0.2191**	**−0.2337**	**0.0943**	**−0.0156**

Student	EPC	O	Q1	Q2	Q3	Q4	EX	AX	TM	IN	SC
1	2.6	4	5	5	4	8	7	6	6	5	3
2	3.2	5	7	6	7	5	5	5	4	4	6
3	2	5	8	9	1	4	3	5	2	7	2
4	2.2	8	5	5	4	7	7	8	5	6	4
5	2	5	7	5	5	7	8	5	4	9	4
6	1.6	3	7	2	4	4	7	4	7	6	5
7	2.2	6	8	4	3	4	6	5	3	6	2
8	2.4	4	6	5	3	3	7	4	7	7	5
9	1.8	8	4	6	3	5	4	6	6	2	4
10	2.2	8	7	6	10	5	4	7	5	4	9
11	2.2	5	4	4	7	3	8	4	6	8	7
12	1.6	7	8	2	3	2	9	6	3	6	4
13	3.6	3	5	5	5	5	7	4	6	7	5
14	3.4	8	7	4	6	7	8	9	2	6	5
15	3.2	8	7	3	5	5	6	6	3	5	5
16	2.8	8	6	5	8	6	8	6	4	6	6

17	2.8	8	5	6	5	9	5	10	4	9	3
18	2	9	5	3	5	6	6	9	4	3	5
19	2	7	7	6	5	6	6	7	5	6	5
20	1,6	7	6	7	4	5	4	7	5	4	5
21	2.6	4	5	6	5	4	5	5	4	4	4
22	4.4	6	10	3	1	7	9	6	1	6	1
23	1.6	6	3	4	5	4	5	5	8	3	4
24	2.6	5	5	5	3	6	7	6	4	4	1
25	1.8	7	6	7	6	6	4	8	3	6	6
26	2.8	3	7	4	3	6	7	4	5	6	3
27	2.8	5	6	4	5	5	7	4	5	7	4
28	2	7	6	5	8	4	5	7	4	6	7
29	3.4	6	4	5	6	4	8	4	6	6	7
30	3.2	3	8	3	2	6	9	5	4	8	3
31	2.2	5	4	6	3	7	8	7	5	6	2
32	2.4	9	5	8	6	6	5	7	5	2	7
33	2.8	8	4	8	9	5	3	7	6	3	8
34	2.4	5	5	4	7	4	8	5	5	6	6
35	3.8	5	5	7	10	2	3	4	6	5	8
36	3.2	6	5	8	6	6	6	7	4	8	5
37	2.4	5	6	4	3	5	10	5	7	6	4
38	3.2	7	3	6	10	7	6	7	5	5	7
39	4.6	5	4	4	7	3	7	5	7	6	6
40	2.6	7	4	4	4	5	6	6	6	5	6
41	1.4	6	6	8	4	6	7	8	3	8	3
42	2.6	5	7	6	5	4	7	4	4	6	4
43	3.4	6	6	8	5	6	3	7	5	4	5
44	3	9	5	7	5	6	4	8	2	6	4
45	2.6	5	5	5	4	5	5	7	3	5	2
46	2.4	7	3	5	7	6	7	7	7	6	6
47	3.4	9	7	5	5	5	5	9	3	5	5
48	2.4	8	3	7	5	8	6	9	6	5	4
49	3	6	6	7	4	7	5	7	4	7	4
50	2.2	8	6	5	5	6	6	8	4	6	3
51	2.8	7	6	6	5	7	5	7	4	5	5
52	2.4	5	7	3	5	4	8	4	4	9	4
53	2.8	5	5	5	4	7	6	7	6	6	4
54	1.6	5	5	5	1	4	8	6	8	7	3
55	2.6	9	5	5	6	5	5	7	5	5	6
56	3.2	5	6	6	2	7	6	6	3	5	3
57	2.4	5	5	4	6	4	5	5	6	6	5
58	2.4	8	4	6	5	6	4	8	5	5	4
59	3.4	5	7	7	6	8	7	6	4	6	5
60	3	7	3	3	4	8	8	8	6	6	4
61	2	4	7	6	5	7	6	7	4	7	4
62	2.6	3	6	4	1	4	8	4	5	7	2
63	2.6	4	7	6	3	6	5	4	4	5	3
64	3.4	5	7	6	3	6	5	6	3	5	4

65	3.6	5	8	5	3	6	7	5	3	8	3
66	1.8	9	6	5	3	5	7	7	5	9	4
67	2.6	5	5	7	4	5	6	4	5	4	4
68	2	5	7	4	5	5	8	6	2	8	4
69	3	6	8	7	5	6	5	6	2	8	3
70	1.8	6	5	5	3	7	7	8	5	9	4
71	2.2	8	4	6	6	6	4	8	7	6	6
72	1.4	6	3	5	2	7	6	7	7	5	3
73	2.8	8	7	4	7	5	6	6	4	6	7
74	2.6	5	5	5	7	5	5	6	6	4	6
75	2.4	6	4	7	5	4	6	6	5	5	5
r		**−0.1127**	**0.1531**	**0.0069**	**0.1925**	**0.1018**	**0.0252**	**−0.1443**	**−0.2234**	**−0.0202**	**0.0970**

4. Conclusions

The preliminary analysis revealed that much the same EPC ratings were provided by the five raters (Table 2). The mean for all the native speaker evaluation was 2.59 and there was a standard deviation of 0.73. The sixteen primary factors and five global factors of the 16pf questionnaire were correlated with the total pronunciation ratings (0.1850 on the $p < 0.05$ probability level).

The review of the data revealed that most of the above-mentioned personality factors do not significantly correlate with the English phonic competence of the subjects at the 0.05 level (Table 3). Overall, the correlation between EPC assessment scores and the personality factors is rather weak. The results show that only two of the factors (I – Sensitivity; Q3 – Perfectionism) proved relevant for the differences in foreign language pronunciation rating, two factors (L – Vigilance; TM – Tough-Mindedness) showed a statistically relevant inverse proportion to EPC. The other factors did not reach the significance level (Table 3).

These preliminary results are generally echoing the statistical findings in [3] and [4]. The hypothesis tested in this study claiming that "There is no relationship between the degree of extraversion and L2 pronunciation quality" was thus confirmed. None of the primary factors contributing to the global factor EX – Extraversion (A – Warmth; F – Liveliness; H – Social Boldness; N – Privateness; Q2 – Self-Reliance) indicated positive or negative correlation.

The study assessed the relation between the overall degree of the perceived foreign accent in non-natives' English speech and the personal extralingual factors which were supposed to affect L2 pronunciation with the primary focus on extraversion. The empirical data clearly indicate that the L2 acquisition is an extremely complex process and no single psychological characteristic of the learner can account for success of the learning process. The L2 phonic competence is a highly complex phenomenon. Namely, it is not always possible to detect a clear correlation between the observed level of the phonic performance of a foreign language learner and any of the factors usually considered the crucial for foreign accent reduction. Thus, it is not always possible to isolate those variables which are considered most important. The mutual influence of a number of factors appears to be so complex that the influence of each and every one of them cannot be singled out and analysed independently, without taking all the others into consideration.

It remains to be seen whether this result will be confirmed and what other more specific insights will be gained during the further course of the experiment. Therefore, no certain generalisations can be made at this point. Like any other piece of research, this study has certain limitations which should be taken into account in interpreting and generalising the results. All in all, it can be concluded that the present study shows that the analysed personality factors may not enhance the level of L2 pronunciation. While an extensive quantity of data exists, it has not yet been analysed in great detail. To provide further insight into the issue of personality traits and the L2 oral performance, an indepth longitudinal analysis with repeated measurements is needed. The second hypothesis, that the effect of extraversion is stable over time, was not analysed in this study. Given the fact that extraversion is considered to be a stable personality trait, we are going to verify its effects on L2 pronunciation over time. The students' progress was traced over a period of ten months and the effect of extraversion on L2 pronunciation does not probably remain constant.

The abundance of data created by such an extensive experiment requires a large effort in evaluating and analysing the many different types of results, and it is also necessary to relate them to each other. As it was postulated before, the selected personality scale and linguistic variables have been highly validated by previous research. Despite the fact that the studies looking at the relationship between extraversion and L2 speech production are rather inconsistent in their findings we hope to devise a well balanced design of our main study based on this preliminary research. The complete study adopts both a cross-sectional and longitudinal research design. A more complex research design would require more advanced statistical techniques, such as multivariate and regression analyses. Longitudinal research is needed to determine more precisely at what point in L2 learning, if any, the extraversion factor has an effect on the pronunciation of L2.

The results found in this study could prove to be of interest for language teaching methodology as it should be the goal of L2 teachers to find the most efficient methodology for L2 (not only pronunciation) learning that would take into consideration the individual differences between students, thus making the acquisition of L2 a more effective, enjoyable and less frustrating experience.

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Lenka Mocova *

COMPARISON OF SLOVAK AND ENGLISH WORD STRESS

The paper defines and describes the basic stress characteristics in general and shows its functioning in Slovak and English language. It also implies that its wrong perception contributes to Slovak-English language interference.

Key words: *word stress, syllable, Slovak language, English language, comparison.*

1. Introduction

As Deborah Cameron puts it, "speech is organized into prosodic units, marked off by pauses and intonation contours: they may or may not have the syntactic structure of complete sentences. Writing, however, relies on the sentence as its basic unit" [1]. Word stress is one of the principal prosodic qualities of speech. It can be defined as "the relative degree of force with which a syllable is uttered" [2].

Prosodic features of speech include variation in syllable length, loudness, pitch, and the formant frequencies of speech sounds. They might reflect various features of a speaker or utterance, the emotional state of the speaker; the form of the utterance (statement, question, or command); possibly irony or sarcasm; emphasis, contrast, and focus; or other possible elements of language (not encoded by grammar or choice of vocabulary).

The question is: how do we distinguish the stressed and unstressed syllables? Peter Roach [3, p. 93–94] mentions two different ways of approaching this problem. The first one is consideration "what the speaker does in producing stressed syllables and the other one is consideration what characteristics of sound make a syllable seem to a listener to be stressed," so we can basically speak about production and perception. It is generally believed that the production of stress depends on speaker using more muscular energy than for unstressed syllables. Measuring this effort is difficult, but not impossible. From the point of perception all stressed syllables show a certain common characteristics that is prominence. The prominence of stressed syllables can be characterized by these features:

- most people seem to perceive that the stressed syllables are louder than the unstressed ones,
- the stressed syllable is usually perceived as longer,
- the stressed syllables are pronounced on a different pitch level,
- the stressed syllable usually contains a vowel whose quality is different from the neighbouring vowels.

We distinguish between several types of stress [4]:
- dynamic or force stress, gained by greater force in articulation with the result of higher loudness and intensity,
- quantitative stress, gained by quantity i.e. duration of the sound,
- qualitative stress, gained by different quality of vowels in stressed and unstressed vowels,
- musical stress, typical for Japanese or Vietnamese, in these languages the prominence is achieved by variation of pitch level.

The place of the stress can be fixed on a certain syllable, e.g. initial in Finnish, penultimate in Polish and the last one in French, or random, as in English. It can often be predictable in English, but many authors have stated, that " English stress is so difficult to predict that it is the best to treat stress placement as a property of the individual word, to be learned when the word itself is learned [5, p.97].

Stress is a relational and gradual feature, since we describe it in terms of prominence of certain elements in comparison to others. Therefore, there are no absolute degrees – maximal stress and no stress at all – and we can only say that some structures display this feature to a greater extent than other. In general, we recognize primary, secondary and weak stress.

Teaching prosodic features of language has a special importance when we realize that successful communication hugely depends on intonation, stress, rhythm and the correct pronunciation of sounds. Recently it also has gained a lot of attention that can be associated with studying phonetic structure of language due to fastly developing fields where using automated voice applications is becoming more and more important and useful. The knowledge of phonetics can also be applied in the modern applications of automated speech understanding, dialogue systems for voice ordering of goods and

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services, automated spech translation, as well as in the research of bio-cognitive functions of human mind [6, p. 114].

2. Slovak Word Stress

In Slovak language the primary word stress is fixed on the first syllable. The secondary word stress occurs in words with more than 4 syllables and is fixed on the penultimate syllable. The word stress in Slovak has a deliminative function which means that its presence marks the beginning of the word, its absence the end of a word. Some regional accents put the word stress on different place, e.g. some accents in Eastern Slovakia, such as Zemplín.

The rules for placing stress in expressions with a preposition are more complex. The prepositions with more syllables such as *medzi, popred, ponad, mimo, vôkol* etc. are stressed on the first syllable as any other words, whereas the one-syllable prepositions as *s, z, v, k, pred, nad, za, po, pri* etc. might be but do not have to be stressed. Here, the general context is crucial – the contextual meaning of preposition, the speaker's attitude, and others. The one-syllable prepositions are also stressed in idiomatic expressions e.g. *robit o dusu; na zivot a na smrt* [7]. In general, there is a tendency towards stressing the preposition.

The unstressed word that is connected to the preceding word is called enclitic. These are: one-syllable words e.g. forms of auxiliary verb to be: *som, si, je, ste, su, sme*, and pronouns such as *ti, mi, mu, jej, vas, ich*, etc. The unstressed words that precede the stressed syllable and are connected to them in the speech are called proclictics.

3. English Word Stress

The position of word stress in English language is changeable, but often predictable. There are 11 stress patterns altogether. Very simply said, in short and morphologically simple words it is often placed on the first syllable, in longer and morphologically more complex words on other than first syllable. However, English word stress placement is a rather complex issue. To decide correctly, one has consider the morphological complexity of a word, the grammar category, the number of syllables and the phonological structure of a syllable [8, p. 97]. Peter Roach [9, p. 97–100] brings a summary of basic word stress rules:

Single-syllable words do not present any special problems, they are always pronounced as stressed. Concerning two-syllable words, one of two syllables is stressed, not both. Let us describe the behavior of individual word categories, starting with verbs. Here, if the second syllable of a verb is a strong syllable, then it is stressed. E.g. apply – ə'plai. If the final syllable is weak, the first syllable is stressed, e.g. envy - 'envi. A final syllable is also unstressed if it contains əʊ, e.g. follow - 'fɒləʊ. Two-syllable simple adjectives are stressed in the same way e.g. even – i:vn, alive – ə'laiv. The nouns are stressed in a different way. If a second syllable contains a short vowel, then the stress normally comes on the first syllable, if not it will stay on the second syllable. E. g. estate – i'steit, design – di'zain. Other two-syllable words seem to act like verbs and adjectives.

Concerning three-syllable words, the situation is a bit more complicated. Let us start with verbs. If the third syllable is strong, it will be stressed. E.g. entertain – entə'tein. If the last one is weak i.e. unstressed, the stress will be on the penultimate syllable. If the second and third syllables are weak, then the stress will be on the first syllable. The nouns behave differently. If the final syllable is weak or ends with əʊ, it is unstressed, if the penultimate syllable is strong, then the middle one will be stressed. E. g. potato – pə'teitəʊ. If the second and third syllables are weak, the first syllable is stressed. E.g. cinema – 'sintəmtə. Three- syllable simple nouns present a new situation, because here even if the final syllable is strong, the stress will be on the first syllable. As P. Roach [10] adds," the last syllable is usually quite prominent, so that in some cases it could have been said to have secondary stress." E. g. intellect – 'intə.lekt. The adjectives behave in the same way, unlike other word categories. The rules are far more complex and complicated, feature a lot of exceptions, thus we cannot cover them all here.

The word stress in English performs several functions [11]:

1. Constitutive. The stress pattern helps to build a word, without it the word would be non-existent.
2. Distinctive. Here, the stress pattern differentiates the words with analogous sound structure.
3. Identificatory. The word stress helps identify combinations of sounds as meaningful linguistic units.

The word stress in English has a dynamic nature, either dynamic qualitative or dynamic quantitative. It is normally demonstrated by the raise of intensity or duration of a syllable, sharpening of the vowel spectrum, the fundamental frequency can rise or fall or there might occur a combination of all there symptoms.

English word stress often has a distinctive function in word compounds. E. g. If we stress the word *green* in the expression *green house* this would suggest we want to mention *greenhouse*/*sklenik*, if we stress *green* as well as *house*, it suggests we want to mention a house of green colour [12, p. 38]. This can cause certain language interference as the Slovak speakers of English tend to pronounce each word as stressed.

4. Comparison

The English and Slovak word stresses differ in many ways. The difference in position is the most obvious one, in Slovak it is fixed on the first syllable, in English it can have any position. In general, the difference in the intensity and vocalic quality between the stressed and unstressed syllables is more noticeable and stronger in English than in Slovak. English unstressed syllables show a significant reduction of vowel quality, whereas in Slovak the vowel quality remains the same in stressed or unstressed syllables [13, p. 37–39].

Here, we can notice the neutralization of unstressed vowels closer to schwa[ ]. The unstressed syllable is almost always changed to neutral vowel schwa that is rare in Slovak. (It is only used by pronouncing the alphabet letters or in the speech breaks to signal thinking) [14, p. 22–23]. English as well as Slovak uses dynamic word stress, but they differ in the force; English word stress ranks among the strongest whereas the Slovak stress is one of the weakest among European languages. In the expressions with a preposition, in English there is a tendency towards stressing the noun, in Slovak the preposition [15].

It is very interesting to notice how recent penetration of anglicisms into Slovak language has been reflected in the field of pronunciation. According to Z. Katreniaková, the signs of phonetic adaptation of anglicisms in Slovak language might be: the change of foreign word stress to Slovak word stress, i.e. to the first syllable, the change of vowel quantity (usually by replacement of a short vowel by a long one), replacement of phonemic groups that Slovak language does not have and the change of unvoiced s between vowels to voiced z [16, p. 7].

The research of Z.Kralova (2005) performed at the sample of 60 Slovak students with the aim of determining the dominant features of segmental and suprasegmental system that make the communication more difficult and contribute to English-Slovak language interference, has clearly shown that word stress is one of the key factors when comes to English-Slovak language interference. 47.06 % of all phonic mistakes were caused by placing the word stress in a wrong position [17, p. 22].

5. Conclusion

The position and functioning of stress in English and Slovak differ significantly. The English culminative stress that has a distinctive function is systematically more rigorous than the demarcative stress with delimitative function in the Slovak language [18].

Such an obvious difference between these two suprasegmental systems often causes a phenomenon known as language interference that includes all the possible communication problems and misunderstandings. E.g. the Slovak speakers often shift the stress to the first syllable in English words, being influenced by the Slovak concept of fixed stress.

Being university teachers, we often notice not much attention has been given to learning pronunciation. This frequently leads to inability to communicate when the students are exposed to "real English" in a future profession or possibly in an English speaking country.

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Marek Hampl *

METAPHOR AS AN ELEMENT OF PERSUASION IN POLITICAL DISCOURSE

This paper deals with the concept of metaphor as manifested in political discourse. The focus of the paper is on how metaphors achieve their persuasive function in political discourse and how politicians make use of metaphors. The paper also provides general theoretical background for the theories of metaphor.

Furthermore, attention is paid to the concepts of persuasion and manipulation in political discourse. The actual examples of metaphorical language are represented by metaphors from the Cold War period.

Keywords: *metaphor, political discourse, persuasion, metaphorization.*

1. Introduction

Metaphors, together with metaphorical language play an essential role in political discourse. Metaphors may serve as useful tools in explaining intricate political arguments by minimizing such issues to metaphorical form. Metaphors may be employed for evoking connotative or emotional reactions and for supporting particular standpoints. Therefore, metaphorical language and rhetoric may be effective when asserting certain political stances or opinions.

Metaphors have pivotal rhetorical purpose in communication with audiences, mainly in situations in which the audiences are emotionally involved. The effectiveness of metaphors is based on the engagement of audiences to which they are addressed. Audiences are also involved in constructing of political discourse, and meta-phors could draw on experiences that are shared by leaders and followers.

Metaphors also help to establish and intensify the connection between the speaker and the audience and to trigger the desired response of the audience.

In this paper, I will present various theories of metaphor proposed by Lakoff and Johnson [3], Bolinger [1] and the concept of political metaphor will be represented by theories of Charteris – Black [5].

The focus of this paper is on how metaphors achieve their function in persuasive political discourse and how politicians draw on metaphors as communicative resources.

I will also provide various examples of metaphors which have been effectively employed within the Cold War political discourse.

2. Metaphors – theory and background

Metaphors are one of primary means through which the world around us is conceptualized. Bolinger [1, p. 141] assumes that the whole world is "vast elaborated metaphor." In addition to this assumption, Bolinger further adduces that the action of categorising reality begins at early age and it is the means whereby people classify their information about the world.

Throughout centuries, as argued by Fairclough, [2, p. 99] metaphors have been associated mainly with the sphere of "poetry and literary discourse."

Any investigation into the domain of metaphors emloyed within political discourse should be anchored within general theory of metaphor.

Lakoff and Johnson [3, p. 6] suggest that "[t]he essence of metaphor is understanding and experiencing one kind of thing in terms of another."

They also claim that metaphor is an essential part of cognitive system of human beings as well as a means through which we organise our experience and make sense of the world around us. Abstract phenomena such as love or time can be perceived metaphorically – to such dimension that these processes have come to be customary.

The definition of metaphor proposed by Lakoff and Johnson [3, pp. 4–6] can be illustrated on the ARGUMENT IS WAR metaphor:

> It is important to see that we don't just *talk* about arguments in terms of war. We can

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> actually win or lose arguments. We see the person we are arguing with as an opponent. We attack his positions and we defend our own. We gain and lose ground. We plan and use strategies. If we find a position indefensible, we can abandon it and take a new line of attack. Many of the things we *do* in arguing are partially structured by the concept of war. Though there is no physical battle, there is a verbal battle, and the structure of an argument–attack, defense, counterattack, etc. – reflects this. It is in this sense that the
> ARGUMENT IS WAR metaphor is one that we live by in this culture; it structures the actions we perform in arguing.
> Try to imagine a culture where arguments are not viewed in terms of war, where no one wins or loses, where there is no sense of attacking or defending, gaining or losing ground. Imagine a culture where an argument is viewed as a dance, the participants are seen as performers, and the goal is to perform in a balanced and aesthetically pleasing way. In such a culture, people would view arguments differently, experience them differently, carry them out differently, and talk about them differently. (emphasis in the original)

On the basis of the stament above, Stocchetti [4, p. 232] notes that metaphors are associated not only with understanding but also with experiencing. He sees metaphors as "communicative devices that, while allowing communication and understanding, are also capable of transferring the attitudes and behavioral patterns associated with one domain to another." [ibid.]

Charteris – Black [5, p. 13] proposes the view on metaphor which stresses its persuasive potential. Charteris – Black notes that metaphor is "an important characteristic of persuasive discourse because it mediates (...) between cognition and emotion – to create a moral perspective on life (or *ethos*)."

At the same time, he argues that metaphor significantly influences our beliefs, attitudes and standpoints because "it uses language to activate unconscious emotional associations and it influences the value that we place on ideas and beliefs on a scale of goodness and badness. It does this by transferring positive or negative associations of various source words to a metaphor target."

Thompson [6, p. 165] defines metaphor as "the expression of meaning through a lexico – grammatical form which originally evolved a different kind of meaning. The expression of the meaning is metaphorical in relation to a different way of expressing the "same" meaning which would be more congruent."

2.1 Metaphor – Pragmatic Characteristic

Metaphors are prime examples of language use where particular implication is situated outside the surface structure of particular utterance. Consequently, they are the main instruments for pragmatic analysis. Searle [7] stresses the view that by employing metaphors speakers say S is P but metaphorically mean that S is R.

Thus, it can be said that the pragmatic characteristic of metaphor in political realm is primarily motivated by the purpose of persuasion. This aspect of persuasion plays an essential role in political discourse which is in many cases covert.

3. Three important aspects of metaphorization relevant for political discourse

Cap [8, p. 71] distinguishes between the following three forces of metaphorization: "an unexpected juxtaposition of conceptual referents in a metaphor is a stimulant of emotions (emphasis in the original) in the addressee." According to this statement, the effect of a metaphor varies from individual to individual who will react according to the social context of the utterance. In the following sentence (1), the concept of love as a joint activity associated with art causes a wide array of representations, including the representation of joint activity.

(1) We are painters of a portrait of love [8, p. 71].

The second type of illocutionary force of metaphor in Cap's view presents an accentuation on *"intellectual bewilderment and perplexity."* (emphasis in the original, ibid.) In this case, confused by semantic strangeness, the receiver of particular message begins to be curious about the possible realization of speaker's suggestions. As *love* presented in (1) does not literally present a work of art, the receiver of the message needs to reason about it in order to "account for the conflict between the semantic referents in the metaphor." Therefore, metaphor presents a suitable means how to captivate the receiver's awareness.

The very last aspect of metaphorization proposed by Cap is *intimacy* (emphasis in the original, ibid.).

In this case, it is the creativity that plays a fundamental role. The bond between the speaker and the receiver of the message depends of the level of creativity embodied in the metaphor. The higher level of creativity results in the closer bond of insight between the speaker and the receiver of the message.

The above discussed aspects of evoking emotions, creating perplexity and intimacy provoke the receiver of the message to take concern in the metaphor and to focus attetntion on the wide array of possible meanings.

In political discourse, metaphors spread because the speakers often benefit from receivers' overlooking of the literal act and they concentrate on its metaphoric representation. This example illustrates the point:

(2) If Saddam does not change his course, we will carry out another surgery on Iraq [after 8, p. 71].

In this case, a non – living object might be in the future exposed to a procedure which is generally considered beneficial. Possible military activities against Iraq, which may seem destructive and violent are presented in metaphorical form as "healthy" for the one who experiences them.

4. Some remarks on the concept of persuasion in political discourse

In the following, a brief overview of the concepts of persuasion and manipulation in discourse will be provided.

Halmari and Virtanen [9, p. 5] argue that all language use may be considered persuasive. They characterize persuasion as "those linguistic choices that aim at changing or affecting the behaviour of others or strengthening the existing beliefs and behaviours of those who already agree" [ibid.]

According to Austin [10] speakers make use of discourse as a certain from of action – to warn, to make promises, and so on.

In Austin's view, it is possible to perceive an utterance in three ways: in terms of its locution, illocution and perlocution.

Locution is associated with "referential sense" [11, p. 19] of the expressions that are used. The illocution refers to "the making a statement, offer, promise, etc." [12, p. 236]

The perlocutionary act is viewed by Levinson [ibid.] as "the bringing about of effects on the audience by means of uttering the sentence, such effects being special to the circumstances of utterance."

Lakoff [13, p. 28] provides the definition of persuasion, and in addition to this, she also stresses the following communicative devices as essential components associated with persuasion: "by 'persuasion' I mean the attempt of one party to change the behavior, feelings, intentions or viewpoint of another by communicative means (...) Communicative means may be linguistic or nonlinguistic (say, gestures), but they are abstract and symbolic (...) Types such as advertising, propaganda, political rhetoric and religious sermons clearly do fall into this category."

This view on language is also essential for the study of political discourse.

It is also vital to discuss and specify the difference between manipulation and persuasion in discourse. Van Dijk [14, p. 212) sees this difference in the following statement

> The crucial difference in this case is that in persuasion the interlocutors are free to believe or act as they please, depending on whether or not they accept the arguments of the persuader, whereas in manipulation recipients are typically assigned a more passive role: they are *victims* of manipulation. This negative consequence of manipulative discourse typically occurs when the recipients are unable to understand the real intentions or to see the full consequences of the beliefs or actions advocated by the manipulator.

5. The Cold War Metaphors

Tkáčová [15, p. 71] notes that "there are language expressions used from one sphere into another one."

One of the major metaphors that predominates considerations about foreign policy is the STATE IS A PERSON metaphor [16, p. 39]. This fact is obvious as organizations and bodies of larger type tend to be in some way personified. Moreover, it is not unusual to come across this metaphor since individual states have become the strongest type of political organization over the last centuries. As persons, states encounter other states that may be seen either as friends, enemies, clients, neutral states, etc. Particular states may be also seen as possessing personalities; they can be trustworthy, cooperative, deceitful, etc.

Personalities of states may also be characterized with the help of animal metaphors – Russia is usually perceived as a bear and England is often associated with bulldog.

If we are to admit that states are persons, they must have bodies, and typical features of human bodies include growth, maturity, strength, disease, weakness, etc.

The "state is a person" metaphor allows a "body-politic to be seen as 'diseased' and, therefore, as a patient requiring treatment." [16, p. 43]

This metaphor can be applied to the early stages of the Cold War, when there was strong rivalry between The United States and The Soviet Union.

In 1946, in an 8,000-word statement from Moscow that was to become known as the "Long Telegram", famous American diplomat George F. Kennan tried to suppress any hopes that the Truman administration could have about the Soviet regime during the beginning of the Cold War period.

In 'Long Telegram' Kennan [17, p. 10] insisted that the United States had to 'examine' the Soviet Union with the same "objectivity (...) with which the doctor studies the unruly and unreasonable individual."

If the Soviet Union is insane, the role of the United States is this case that of doctor. As it is known, one of the ways how to treat mental patients is to bind them up in a straitjacket. This is in some degree the essence of the policy of containment which proclaimed that the Soviet Union could not have any territorial gains and that the worldwide influence of the Soviet Union should be reduced to minimum.

In addition to this, Kennan also stated that "[m]uch depends on health and vigor of our own society. World communism is like a malignant parasite which feeds only on diseased tissue. This is point at which domestic and foreign policies meet."

In this short fragment we again encounter, as Beer and De Landtsheer put it [18, p. 65] "matters of sickness and wellness."

From these metaphors, it can be also deduced that the American society had to be kept in "health and vigour" which referred mainly to military strength.

6. Concluding remarks

This article has presented a "mixed area" where politics and metaphors occur together. We started by laying out general theories of metaphor and its pragmatic concept [18, p. 261].

Also, a short list of some metaphorical sources has been sketched in order to illustrate their relevance for political discourse [ibid.].

As it has been discussed in the text above, metaphors represent the core examples of persuasive language use. They are extensively employed and deeply embedded within important political text and talk. Metaphors are not just mere expressions. They act as concepts that often work in argumentative structures of political speeches. At the same time, metaphors create particular basis and the justification for the expressing of particular kind of policy and its possible realization.

They are figures of speech which can be widely used in persuasive political arguments, mainly because they represent particular way of looking at world that reflects, according to Charteris – Black [5, p. 20] "a shared system of belief." Metaphors may also present a way of perceiving the world which may be different from the way that we usually look at it.

We fully agree with Beer and De Landtsheer [18, p. 263] who are of opinion that "politics occurs in metaphorical world and world politics is inevitably metaphorical."

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INDIVIDUALIZATION, ENVIRONMENT AND CHRISTIANITY (CHALLENGES AND VISIONS OF NEW ETHICS)

The article reacts to new challenges in the phenomenon of individualization that are accompanied with the extreme scientific and technological growth. It focuses on controversial issues of civilization and traditional ethics: anthropocentrism, consumerism, individualism, and scientism. It stands for new ethics that would connect the good of man with the good of the environment.

Key words: *individualization, anthropocentrism, civilization, asceticism.*

1. Individualization – Phenomenon of Postmodern Society

Individualization is a distinctive phenomenon of the postmodern society. In present understanding the individualization means: "The act or process of individuating, especially the process by which social individuals become differentiated one from the other" [1, p. 565]. Nowadays, the individualization is accompanied with many obvious issues: human rights, respect to minor cultures and lifestyles; in information technology with using notebooks or communicating via social networks and mobile phones; its influence can be seen in consumers' demands for individual packaging of products; individual approach is required in human relationships; education system tries to include handicapped learners or learners with various disabilities; the offer of the internet banking, or such a negligible thing like plastic bags at supermarkets for each customer. The postmodern period put the individual on a pedestal. What was appointed to be used only by the elite in the past nowadays can be used by the whole population. Democratization has enabled an ordinary man to make use of all comfort a modern way of life offers. However, such approach brings many problems. Experts warn of destruction of nature and the environment, technocracy, worsening of human relations, lack of communication, disintegration of traditional values, egocentrism, consumerism, the insuperable gap between the rich countries of the Western region and developing countries of the Third World. As it is clearly visible many predictions have already come true. The terms 'crisis' and 'depression' have become natural parts of everyday language. However, once the level of individualization has reached its peak, there is no way to step backwards and let the man disappear in the crowd.

2. Anthropocentric Orientation of Western Civilization

The individualization is closely connected with the anthropocentric character of Western intellectual tradition, the phenomenon that has been glorified as well as damned. The anthropocentrism placed the man's well-being into the centre of the universe: "The essential feature of the anthropocentric dimension of the cosmological domain is the belief that humans are separate from and ethically superior to the rest of nature. As a result, humans consider themselves to be rightfully, the masters of nature subduing it for their own instrumental purposes" [2, §5]. To justify this, humans use various explanations based on ontological and epistemological reasons. The anthropocentrism developed in several lines throughout the *Western culture: Greek tradition, Christian religion and the scientific development.*

As long as the civilization had not been affected by the enormous growth in technocracy, industrialization and their invasive interference into the nature, anthropocentrism stood for cognitive, ontological, moral superiority of a human being over the material reality. The basis lies in special qualities of the man. The ancient Greeks stressed the reason (logos) as the main distinctive feature. Socrates pointed out at 'daimonion' that represented an inner voice of which he said: "This sign I have had ever since I was a child. The sign is a voice which comes to me and always forbids me to do something which I am going to do, but never commands me to do anything (...)" [3, § 34]. Worth mentioning could be the term 'telos' that is the Greek word used in Bible for perfection as it stands for the Greek equivalent of the Latin word 'perfectio'. The term was highly used in the Ancient philosophy in the meaning of

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purpose, goal, end. Aristotle comments: "There is some end of the things we do, which we desire for its own sake" [4, §1]. The European tradition inherited the idea that each thing had an inner plan, intention, or a fixed place in the hierarchy of being that determined its position and role in the universe. Thus, the teleological organization of the world had raised the man on the top of the pyramid for thousands of years.

Another lineage of anthropocentrism develops in Christian tradition which based human prominence on the creation of the man in the 'Image of God' [5]. Due to this the man was endowed with such qualities like: intellect, consciousness, freedom, soul. As these qualities are analogous to perfect qualities of God the man is a "free and intelligent subject with the capacity to know God, truth and goodness" [6, § 4]. Moreover, by words: "let them have dominion over the fish of the sea, over the birds, of the air, and over the cattle, over all the earth and over every creeping thing that creeps on the earth" [5, Gen., 26], the man was authorized to act on behalf of God. Unfortunately, humanity may have forgotten the other side of the biblical command requiring the man to take care of the Earth and subsequent responsibility for its well-being. Following the Christian tradition, the ideas of environmentalism and ecology can be traced in spirituality of the Italian Catholic friar Francis of Assisi – a patron saint of animals. According to his rule: "we should respect all creatures, animate or inanimate, which bear the imprint of the Most High and we should strive to move from the temptation of exploiting creation to the Franciscan order of universal kinship" [7, 18].

The last lineage of anthropocentrism leads via the scientific and technological development. Its primary purpose was focused on recognition of laws of nature following the improvement of life and its conditions in order to support human well-being. Francis Bacon appeared to be a pioneer when stating that 'scientia potentia est', ergo knowledge is power [8] opening the way for the incredible development in science and technology. In this meaning anthropocentrism follows the idea that the man's greatness lies in capability of knowing, applying and even interfering the natural world and the use of the knowledge for human benefit. An important element could be seen in demystification of nature which supported its instrumental role and approved the manipulation with the environment. Finally, the influence of science has appeared pretty ambiguous. Although it has improved the life of an individual and enriched human existence by many astonishing inventions; its aggressive expansion has threatened other parts of reality. Thus, anthropocentrism is a best friend of individualization, but probably a main competitor of the environment.

3. Civilization, Culture and Traditional Ethics

The main area through which individualization can realize its potential is culture. Talking about culture, there are many interpretations and variables in its meaning. The first usage of the term could be ascribed to Cicero [9] who mentioned 'excolere animum' in the sense of cultivating the man's personality. The indication of cultivating the soil is not incidental. Hannah Arendt states [9] that 'culture' leads to Roman word signifying to cultivate, take care, dwell and preserve. As she continuous, the word was originally used in agriculture for cultivating the land for human habitation. In general, culture could be seen as an expression of self-realization of human race and an individual human being. It is the embodiment of the man's intellectual creativity that serves both desires: it expresses abilities as well as it fulfils human needs. Albert Schweitzer [10] differentiates three main areas of culture:

1. Civilization: progress in gaining and applying scientific and technological knowledge.
2. Socialization: progress in understanding habits, symbols, norms, values of particular society as well as human society as a whole.
3. Spiritualization: progress in religious, artistic and moral comprehension.

He finally concludes [10] that culture preferably referrers to 'technology' which he sees as a human control of reason over natural forces; and 'ethics' that is a human control of reason over abundance of opinions. Although both branches support the process of individualization, they do not equally participate in the development of an individual and of the society.

As it can be mentioned, civilization incredibly supported the process of individualization. Ortega y Gasset states [11] that it raised the ordinary man. At this point, individualization is connected with democratization as the access to civilization conveniences. What was appointed only for the elite of society could be now achieved by anybody. Apart from such visible examples like machines, gadgets, home appliances, the significant issue can be seen in economic and emotional comfort, medical care, education, safety, entertainment, free time, travelling. Nowadays, the indivi-dualization means the opportunity to use all achievements of scientific and technological development in order to improve the individual's quality of life.

There are more controversial issues to mention. It is very-well known that since humanity have concentrated on technological and industrial advancement; the ethics did not manage to keep up with the incredible development. As a result, it is not prepared to correspond to actual challenges. There are two theories to clarify this disproportion: As humanity overvalued civilization, culture and ethical matters have been constantly neglected. Other thinkers criticize the exclusivist nature of European traditional conception based on Plato and Christianity. These have been affecting the intellectual field by supporting a monistic system offering only one way of seeing and treating reality. They did not allow new ideas interfering into the system and thus, they did not provide a chance to react to the new situation. Thus, ethics accepts imperatives of environmental or media pretty gradually. Hans Jonas [12] puts the traditional ethics under suspicion stating that its obsolescence lies in:

1. Anthropocentric character: traditional ethics does not deal with nonhuman world. It means its interest covered the relation and acts among people and attitude of the man to God. The only 'out of the man' area of traditional culture's concern was the so called 'techné', which appeared to be ethically neutral.

2. Immediate impact: the goals of traditional ethics were planned to be of immediate reach, ethics interest was limited to 'here and now'. As Jonas states "the effective range of action was small, the time span of foresight, goal setting and accountability short, control of circumstances limited" [12, p. 5].
3. Objectives: the traditional ethics assumed that "the ethical universe is composed of contemporaries and its horizon to the future is confined the foreseeable span of their lives "[12, p. 5].
4. The character of knowledge required for the ability to lead morally justified life was not of a specific nature. It was a merit of ordinary intelligence and not knowledge of scientists and professionals. Moreover, traditional ethics supposed that consequences of human behaviour decisions had non accumulative character.

As a perfection of the traditional ethics can be given e.g. the Gospel According to Mark: Love thy neighbour as thyself [5] or Immanuel Kant's categorical imperative: "Act only according to that maxim whereby you can at the same time will that it should become a universal law without contradiction" [13]. As they considerably contributed to individualization putting emphasis on autonomy in moral judgement, they were bound to the period without the immense civilization growth. As such they need to be supplemented or replaced with new imperatives restrictive to interference of humans. In Jonas's words: "It would mean to seek not only the human good, but also the good of things extrahuman, that is, to extend the recognition of 'ends in themselves' beyond the sphere of man and make the human good include the care for them" [12, p. 8]. For Jonas [12] it means to connect the growth in individualization with the growth of physical reality so that the world would not be only of instrumental value for the man´s life but integral and indivisible part of the development of humanity.

4. Environment and Christian Philosophies

Although the need for individualization is reaching the climax, the protection of the environment became a must for sustainability of human progress. There is a considerable need of new ethics. As being aware of impossibility to break up the expansive line of civilization all suggestions ground their ideas in connection of individualization with protection of nature; they include the good of man into the good of the environment.

Despite the criticism of traditional conceptions, many followers of Christianity have been trying to reform an opinion of Bible on individualization, science, technology and the man's relation to nature. At first they have acknowledged the phenomenon of a change, growth, development so many years disregarded in the Christian code due to the strong influence of Platonism. Secondly, they accepted the latest scientific achievements. The acknowledgement of Darwin's theory of evolution belongs to the greatest victories by which Roman Catholicism has understood the process of individualization and variability of life. The feature of change and development became a significant part of theories of such prominent thinkers like: Theilhard de Chardin, John F. Haught and Karol Wojtyła. The scholars agree that Bible has always shown a strong potential for an individual: the creation in the 'Image of God', self-recognition, self-realization, a specific role of each person in care and development of the Universe enriched in experience of a personal relationship to God appeared to be strong motivations to support self. Romano Guardini [14] adds that the process of individualization starts with a ceremony of giving a name to a newborn. Having a name, the infant becomes a full member of the society. In Bible, as soon as God created the Man and Woman, He called them by their names. Adam and Even have been recognized in the 20th out of 31 000 verses, unfortunately, after they had been eating fruit from the tree. The both acts (naming and eating) are evident examples of individualization.

The importance of individualization is clearly expressed in spiritual gifts. Bible encourages the man that "there are diversities of gifts, but the same Spirit. There are differences of ministries, but the same Lord. And there are diversities of activities, but it is the same God who works in all. But the manifestation of the Spirit is given to each one for the profit of all" [5, 1 Cor. 12, 4–8]. Unfortunately, the objections pointed out at anthropocentric orientation of the religious concept. Especially if referring to redemption that is reserved to only a human being not considering the physical world at all. Moreover, the division of reality into the temporary 'material world' and the eternal 'World to Come' makes nature insignificant to human interest. Thus, Christianity is sometimes blamed to have neglected non human matters.

John F. Haught, the Roman Catholic theologian with a special interest in issues of science, cosmology, and ecology tries to refute the objections. He [15] provides verses which demonstrate the justifiability of religion to put an effort into natural issues. By re-explanation of their ideas he opens up the minds of atheists as well as believers showing a true interest of Bible to support the reality as a whole. The following verse from The Book of Revelation according to Haught [15] confirms that all things, personal as well as non personal are taken into redemption. "And every creature which is in heaven and on the earth and under the earth and such as are in the sea, and all that are in them, I heard saying: blessing and honour and glory and power be to Him who sits on the throne and to the Lamb, forever and ever [5, Rev. 5, 13]. The words of a great importance could be found in The Old Covenant as well. There is a clear promise: "For I will cause the captives of the land to return as at the first, says the Lord" [5, Jer. 33, 11]. The main idea of the approach offered by Haught´s evolutionary theology is [15] that the cosmos as a whole, similarly to the act of its creation, is appointed to the salvation. There is a great consequence for humanity in this statement: the redemption of people is indivisible from the redemption of the environment and it will not be realized without the participation of the physical reality. Therefore, all activities supporting individualization should be in harmony with natural surroundings.

The ideas with the interest in inclusion of the reality into the redemption are incorporated in philosophy of a French visionary anthropologist Pierre Teihard de Chardin. Being a biologist he does not resist to react to the latest scientific research using the elements of evolution (development), individualization and spir-

itual growth in order to connect the Christian doctrine with (from the point of Christianity of that time) controversial, Darwin's theory. He [16] starts with the configuration of the Universe as evolutionary process developing in two directions: inferior (individual) and superior (collective) with the final 'Omega Point' into which both converge. Through individualization, spiritualization and unification the universe unfolds in several evolutionary stages: geogenesis (beginning of Earth), biogenesis (beginning of life), anthropogenesis (beginning of human life), noogenesis (the emergence of the sphere of human thoughts), Christogenesis towards the Omega Point. The important milestones in the evolution are those that show the emergence of consciousness: development of personal beings, consciousness, self-reflexion, cognitive skills, intellect and their representation in human activities like science, religion, art. Thus, the man has a special role in the evolutionary process: "If we wish to settle this question of the 'superiority' of man over the animals, I can only see one way of doing so – to brush resolutely aside all those secondary and equivocal manifestations of inner activity in human behaviour, making straight for the central phenomenon, reflection" [16, p. 164–165]. Naturally, he sees the important stage of evolution in the emergence of the mind and intelligent beings (noogenesis). "Noogenesis rises upwards in us and through us unceasingly. We have pointed to the principle characteristics of that movement: the closer association of the grains of thought; the synthesis of individuals and of nations or races; the need of an autonomous and supreme personal focus to bind elementary personalities together, without deforming them, in an atmosphere of active sympathy" [16, p. 257]. The theory might end up in two conclusions:

1. Reality works as an organic and dynamic whole in which humanity creates an important, but still ontologically limited part of the process. Humans are contingent and depend on other constituent. The redemption is an evolutionary process that unifies, spiritualizes and individualizes the world into its final Omega Point.

2. Individualization of the Universe is a process that comes into the existence and is realized via the biological, cultural, technical, scientific, spiritual and intellectual development. Thus, anthropocentric orientation, technology, science and lately also informatization might not have to be elements violating the quality of human life. On the contrary, they are integral parts of evolution.

5. Vision of Ascetic Society

However, many thinkers of the 20th century are pretty cautions to praise the extreme technological and scientific growth. They are aware of dangers humanity and their surroundings might be threatened with. The main warnings are aimed at the economic order that is based on consumerism. An economist Victor Lebow stated: "Our enormously productive economy demands that we make consumption our way of life, that we convert the buying and use of goods into rituals, that we seek our spiritual satisfaction and our ego satisfaction in consumption. We need things consumed, burned up, worn out, replaced and discarded at an ever-increasing rate" [17, § 19].

Not only Lebow explained the consumerism, but he also connected the individualization and excessive buying. In the period of fragmentation, disintegration of values, loss of identity, loose family and cultural roots people are desperately searching for something what would support their feeling of belonging somewhere and being somebody of a particular significance. They concentrate on things that are offered and are said to emphasise their value. The latest fashion including portable novelties in electronic industry, luxury goods being on display, ability to replace an old product by a new model, travelling, cosmetic industry are creators of people's personalities. It is mainly the luxury in various ways which is a way of individualization in Postmodernism. However, consumerism devours its own children. Hans Jonas says that if we want to preserve the world and the same living conditions for next generations we cannot afford such lifestyle. He asserts: "happiness of present or proximate generations would be bought by unhappiness and or even non existence of later once" [12, p. 11] A solution lies: firstly, in reduction of consumption and secondly, as science has already caused irreversible damage to the nature, in sensible control of the scientific research. The supreme imperative is preservation of human life. Therefore, he updates Kant's categorical imperative: "Act so the effects of your action are compatible with permanence of genuine human life, or negatively, Act, so that the effects of your action are not destructive of the future possibility of such life" [12, p.11]. Thus, neither individualization nor civilization is entitled to menace the continuance of the life on the Earth. The objective of the new future-oriented ethics is something which has not come into its existence yet: next generations.

His ethics can be compared to Weizsacker's suggestion. In the title of his books he asks [18]: 'Are we going towards ascetic culture?' There, he offers [18] a radical idea of culture that consciously and voluntarily surrenders on commodities that are accessible in order to handle reasonably with civilization. His idea of individualization lies in virtues of moderation, temperance, self control, asceticism, compassion, sensibility. They are issues of individual freedom, individual decision and individual awareness by which the man proves himself to be a responsible citizen of the 21st century civilization. According to Weizsacker [18], it is the only way how humanity can prevent exhaustion of material sources as well as emotional and moral vacuum. As an opposite to the solution offered by the Christian scholars we can mention Slovak thinker Vasil Gluchman [19] whose conception appears to be more realistic while introducing his solution of 'sensible egoism'. According to him humanity will have to accept limitation of consumption, but not voluntarily, but as an entire necessity. However, the theory supports the anthropocentrism because it focuses on the features of self preservation rather than on an ethical choice.

The attitudes described above are essential supplements of ecocentrism [2] the nature-centred system of values, that would deny humans as the sole bearers of intrinsic value. It also provides a guarantee of an inherent value of nature in its own right. This approach puts emphasis on balance and mutual dependence between

humanity and the environment as it had been stated in the book of Genesis. Despite the qualities (logos, free will, intellect, daimonion) the man was endowed by his Creator, he seems not to be mature enough to be a centre of the Universe in order to take care of the Earth. The metaphysical rebellion [20] as well as demystification of nature proves to be ambiguous processes. Thus, individualization in moral field that enables each man to decide and act autonomously has not been completed yet. Apparently, it still needs a leadership of a code protecting fragile parts of reality.

6. Conclusion

The growth of civilization is closely connected with the quality of life and more opportunities for an individual. Despite all benefits humanity need to confront many challenges among which the most serious is environmental damage. There are more aspects why the man feels entitled to interfere into the environment: anthropocentrism of culture, traditional ethics that does not correspond with requirements of scientific and technocratic age, attitude to nature that states its instrumental character towards human life, invasive intervention of civilization into the balance of nature. There have been more solutions offered. The new ethics requires including the goods of nature into the goods of human life, replacement of consumerism with voluntarily asceticism, sensible control of scientific research. Human thinking should shift its orientation from 'human centred' to 'nature centred' in order to protect not only contemporary people but preferably to preserve the existence of next generations.

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PUBLIC RELATIONS AND JOURNALISM

The paper offers the findings of possible interconnection between journalism and public relations. It was created as a reaction to the need to explore the level of influence (and impact) of public relations worker on journalism. This need was accompanied by the attempt to look into the issue both from the aspects of journalist and public relations worker. We focused on the exploration of media environment (in relation to media market) with respect to possibilities of being influenced by marketing, specifically by the area of public relations.

Keywords: *public relations, journalism, interconnection*

1. Introduction

The issue of media environment is very interesting, but too complicated to be mapped and analyzed in its absolute entirety. Nowadays, the questions dealing with the penetrating of the infotainment into the area of news service are raised, together with the questions of increasing interconnections with some areas of marketing (advertising, public relations).

Regarding the fact that the dynamic marketing progress disturbs the traditional procedures in the area of journalism, it has become the subject matter of wide professional and academic interest, and vice versa, the marketing workers are interested in the attributes of media environment-functioning and creation of media content.

The knowledge and perceptive procedures of the functioning of media and marketing environment are the precondition to the determination of the level of the usage of marketing (or PR) contents in seemingly journalistic manifestations.

The article presents particular results of the research which has been motivated by the need to explore the level of influence (and impact) of public relations worker on journalism. This need was accompanied by the attempt to look into the issue both from the aspects of journalist and public relations worker. We focused on the exploration of media environment (in relation to media market) with respect to possibilities of being influenced by marketing, specifically by the area of public relations.

2. Research

The aim of the research was to map mutual similarities, differences and interlinks between both areas (journalism and public relations) and to set the level and causes of the penetrating of information from press releases into the area of journalism.

An important inspiration for the research was one of the journalistic rules that a journalist should use information from different sources at his/her work and the feeling that this rule is often forgotten and overlooked and PR materials have become an essential source medium for journalism.

To reach the aim we set five elementary hypotheses and to increase the relevance of the research we used three research methods. The results of the research could be consequently compared and interpreted in wider connection. The basic pillar of the research was the content analyses of texts (press releases and selected media contents). We used also questionnaires and non-structured qualitative interviews with PR workers to ensure the complexity of information.

Press releases and their reflection (media contents in the form of editorial contributions) in the segment of print media (yellow and serious journalism) and their online versions on the Internet, as well as the editorial contributions of press agencies are the subject matter of our research. The further stage of the research was based on questionnaires and interviews with PR workers and journalists.

We focused on the exploration of media environment stressing the borderline connections with marketing, primarily with the area of public relations. The aim included several points:

- To confirm or confute the possibility of the penetrating of information from the press releases to the area of news service.
- To determine the influence of press release on the number of media outputs.
- To characterize the relationship between PR workers and journalists.
- To analyze the use of press release as an information source. [2]

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The research realization was conducted in several phases:

The first phase of the research: the study of relevant texts with the aim to understand and analyze up to now knowledge relevant for the research theme.

The second phase of the research: the determination of hypotheses and the proposal of methodology (including data gathering from subjective enunciations).

The third phase of the research: The research realization (content analysis, questionnaire, qualitative interviews).

The fourth phase of the research: The analysis of data, interpretation of findings and evaluation of the research.

The selection of research sample

The selection of research sample reflected the current situation in Slovak media environment. Selected press releases and media contents (technologically quite simple which allowed the realization of their content analysis), the answers of respondents in questionnaires and interviews with PR workers were the subject matter of the research.

Before the research realization five research hypotheses were stated:

Hypothesis No. 1: More than one third of published press releases are the basic information source for the creation of journalistic contributions.

Hypothesis No. 2: Journalists use press releases for their journalistic contributions without adequate verification of information from different sources

Hypothesis No. 3: The theme of press release influences the level of its importance for journalists (public).

Hypothesis No. 4: PR workers economically pressure journalists.

Hypothesis No. 5: Positive relationships between PR workers and journalists are the main reason of the press release penetrating into the area of news service.

3. Methodology of research

We used the combination of three methods in the methodology of our research – content analysis, questionnaire and qualitative interview. The reason was an attempt to increase the relevance of the research.

The questionnaire was validated by means of questionnaire for PR workers and content analysis. The answers in questionnaires were compared with the results of analysis of particular media outputs.

We tried to increase the reliability of content analysis by the rigorous determination of percentage exploitability of press releases and percentage of press releases in media outputs. Only the identical (not paraphrased) words, sentences and paragraphs were considered as a relevant unit for the analysis in each case.

The aim of the analysis was to determine the level of equivalence (expressed in the percentage of press releases on media response) with the media outputs in print media. We explored whether the selected press releases in newspapers, magazines and online media are published in:

- identical version,
- partially changed, not appended version,
- partially changed and appended version,
- not published.

We also explored the possible interconnections between the themes of press releases and their attractiveness to journalists (i. e. which of the press releases are the most interesting for the journalists). When choosing the press releases we focused on the following areas: politics, economy, culture and edifying activities.

The content analysis of the products required the specifying of documents for the research. We concentrated on written, publically available institutional documents (print, online media and press releases), which were examined in the context of preset themes without regard to periodicity of their occurrence. We mainly focused on press releases, and then print and online media published in Slovakia. The underlying condition for the subsuming of an article (in printed or electronic form) to the research was its particular or general equivalence with examined press release published on the Internet.

The selection of press releases was based on the method of coincidental selection in respect to the formerly chosen thematic fields and the subject matter of further analysis were only the press releases which were completely or partially transformed into the form of a particular media output (article in printed or electronic media).

30 press releases were the subject matter of our research. 14 articles published in different media with the name of their redactors (redaction, agency) met our requirements for detailed analysis (disclosure of similarity or identity with the prototext of press release).

We considered following as a classification unit:

- integrated contribution specified by the title “press release”,
- integrated contribution tagged by a title.

We defined a word as a coding unit and selected following elements for the classification:

- media output: yes (number)/no (x),
- frequency (media response of a press release) – the description of media which published the articles inspired by the particular press release,
- extensity (the percentage of a press release in media output) – the prevalence of the code – the number of the words in an article which are identical with the words of the compared press release.

Following elements were evaluated in the analysis of press releases [according to 1]:

- title,
- author of the press release,
- publication date,

- press release focus,
- press release theme,
- number of words,
- media response of press release (frequency): yes (description)/ no (x) the use of press release in media: percentage

We added following elements to the analysis of media outputs:
- media response of an article (in the case if a press release was published by a press agency),
- main source of information: specified (specification)/non-specified,
- other sources of information: yes (description)/no (x),
- the prevalence percentage of a press release in an article (extensity): percentage of the number of identical words with prototext of the press release.

Following criteria and quantification method were chosen for the comparison of the selected press release with particular media output (the article):

Exploring the equivalence of the press releases with the media outputs we focused on the measurement of the number of identical words, sentences and paragraphs, as well as on the frequency of the prevalence of a word (coding unit) in the text.

Regarding the fact that it is necessary to adjudicate the texts in their context, we assumed some controversies in analyses. For the minimizing of different aberrations (specifically subjective evaluation) and the improvement of data quantification we specified that power and intensity of examined phenomenon would be expressed in percentage (percentage of press release in media output and percentage of the press release use.)

After the realization of the content analysis we can state several important findings. In the preparatory phase of the research we assumed that the researches conducted by several professionals in the area would correspond to the outcomes of our analysis. The mapping and analyzing of 30 different press releases allowed us to submit that the editors of print media in news service did not use press releases in any case.

The specific focus was laid on the attempt to find connections between press releases and news service in so called serious daily papers in Slovakia. No direct connection was found. Surprisingly, we have found out that in the case of similarities between press releases and media response the only sources used by the editors of specific media was from the prepaid service of press agencies.

From the total number of examined press releases 18 press releases had no media response. The other 13 press releases were primary (and almost the unique) information source for the news contributions. All articles state as their main information sources press releases or speaker (i. e. a PR worker is an information). In no case other information source was specified.

When analyzing the texts we focused on the facts mostly interesting for press release editors. We found out that the press releases from the area of politics are the most attractive (five from the total number of seven press releases are from the area of politics). The second place is occupied by the press releases focused on the edifying activities and health campaigns (three from five press releases). This fact may be explained from two points of view. First, an ambition of editors to help with the advertising of positive activities, and second, the journalist outcome corresponds to the theory of gatekeeping, which means that journalists prefer the news having so called human touch. The press releases from the area of culture were not as interesting (three from seven press releases) and the press releases from the field of economy were the least interesting [2].

It is worthy to mention the composition aspect of the texts as well. If the editors are inspired only by the press releases they rarely change the texts and usually keep the original composition. The titles are only a transformation of press release title or its main idea. Creativity and original asset of an author are not usual; we may say that it is very rare.

The research followed the aim to explore particular phenomena also from the perspective of a PR worker. From his/her perspective we must conclude that we may consider PR as successful if more than one third of published press releases appear in media in an almost original form.

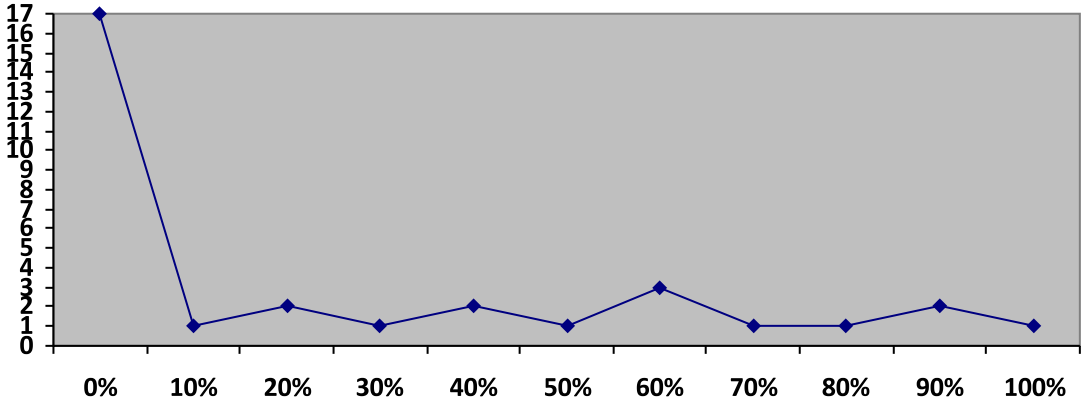

Fig. 1 The share of press releases editorial contributions in relation to the number of articles

On the basis of content analysis we may state that the hypotheses No. 1, 2 and 3 were proven true. The facts were further verified by means of a questionnaire.

While realizing our research we sent e-mails to 100 journalists and to the same number of PR workers who could answer the questions in questionnaires anonymously by means of independent web application. In accordance with our assumption more PR workers than journalists joined the research (the return of questionnaires was 40%). The return of questionnaires from the journalists was only 20%. The similar situation repeated when we tried to realize qualitative interviews with journalists. While all of the three addressed PR workers agreed on the interviews (the interview was conducted by means of phone call or e-mail), no journalist agreed to participate.

By means of particular items in the first part of the questionnaires we explored necessary demographic data. We were interested in the age of the respondents and the time (in years) they had spent in spotted areas (PR, journalism). Other demographic data (gender, ...) were considered in our research as irrelevant.

The questionnaire had 14 items which were divided into four groups as they could correspond to the need to verify preset hypotheses. The groups of questions aimed to map the level of press release publishing in print and online media as well as the verification of information in press releases and other sources, relationships between PR workers and journalists and possible pressure on journalists caused by PR workers. The questionnaire was created in a way to ensure respondents' comfort when answering the questions. We assumed that both target groups have time-consuming and stressful jobs, which means that in the case of a complicated questionnaire they would not have answered at all.

The average age of the PR workers was 35.28 years; the youngest participant was 26 years old, the oldest 59 years old. The average age of the journalists was lower – 31.76 years; the youngest participant was only 19 years old and the oldest 59 years old. The results show that in both areas (PR and journalism) mostly young people work. The professional experience of the journalists is less than five years and experience of the PR workers is up to 10 years. The differences are clear mainly in connection with the last indicator (period of work experience is 10 – 15 years) which adverts to the smaller number of PR workers. This fact may be explained by the young tradition of PR profession.

31 PR workers from the total number of 40 think that journalists follow internal editorial rules for their work with PR materials. Only five of them are convinced that journalists ignore the rules. Regarding the fact that in our questionnaire we explored how long the respondents had worked in the professional area, we were interested in the answers of the most experienced PR workers. Those who have worked in PR more than 15 years (only two) concurred in the fact that journalist rather respect editorial rules. This finding correlated to the outcomes of our content analysis.

The journalists conveyed the same – 15 journalists from the total number of 20 answered that journalists follow internal editorial rules. Surprisingly, 5 journalists could not give clear answer yes/no. More than half of the PR workers (25) are convinced that journalists publish PR materials as editorial contributions. On the contrary, more than half journalists (11 from 21) think that it does not happen. Most journalists (4) who think that their colleagues work this way have been in the area of journalism less than 5 years. 35 from 40 people working in PR confessed that their PR material had been published in its original form, whilst the most positive experience with this have the PR workers who have worked in PR less than 5 years. None of them has had an experience with at least one unpublished PR material or TS. The journalists had slightly different attitude. 18 journalists answered clear "no", only three of them answered "yes". From these three two have worked as journalists less than 10 – 15 years, one more than 15 years. These findings enable us to conclude that the higher age of a journalist, the more opportunities (and possibly mistakes as well) may influence him/her at their work.

17 journalists from the total number of 21 answered that they verify information. The answers do not correspond to the results of the content analysis from which resulted that if a journalist uses a TS he/she does not verify it in other sources. This discrepancy may be explained by the fact that there were more print media editors than editors from press agencies involved in our research and their answers increased the number of positive answers.

PR workers are convinced that they do not put pressure on journalists (27), but 12 from 40 confessed that PR agencies intrude media workers. The journalists think differently. 13 journalists think that PR agencies put pressure on them. It is necessary to complete the information that 23 PR workers and 13 journalists think that a present a journalist is offered does not influence the content of media outcome. Simultaneously, a smaller part of PR workers and journalists thinks the opposite.

In the sixth part of the questionnaire both target groups mention different kinds of smaller or bigger presents, which are offered or accepted. From among them the most valuable are notebooks, software applications, electronics, jewelry, holidays, mobile phones, wellness stays, trips abroad, invitations to cultural or sport events, alcohol (luxury wine), beer barrel, food and cosmetics, exclusive pens, ski tickets, 500 EUR, ...

Some of the PR workers and journalist think that they haven't had any experience with presents, but one of them admitted an offer of a trip to Monza F1. Regarding considerable benefits (question No. 10), which might lead to concealing information, the PR workers (39 from 40) adduced that they had never been offered any of them and the journalists unanimously answered that they had never accepted any of them.

Hypothesis No. 4 not proven

Regarding the last hypothesis we may conclude that 38 PR workers admit benefits of positive relationships with journalists in the time of critical communication. Concerning the TS publishing as editorial contributions, more PR workers think that the main reason is busyness of journalists, their non-professional attitude to work and the last place is occupied by positive relationships with

them. Some of the PR workers provided further explanations for publishing their press releases. For example, three PR workers think that the reason is the quality of sources, professional PR and serious information ("well-taken and informative value of PR"). One PR worker said the following about journalists' tendency to subscribe PR: "They are not as good at a certain area, they are too busy to study the topic, there is no investigative journalism in Slovakia".

A major part of PR workers does not admit their dependence on journalists (30), only 8 of them think that PR workers depend on journalists; two expressed that journalists depend on PR materials (workers).

The journalists think the opposite regarding PR workers and journalists. 10 from 21 respondents answered that the relationship is equivalent, but almost the same number of them think (11) that PR workers depend on journalists. No journalist expressed an opinion that journalists depend on PR workers.

The journalists' view on the publishing of TS as editorial contributions is also interesting. More than half of them (11) mentioned non-professionalism of their colleagues; the second place is taken by busyness of journalists. Positive relationships with PR workers as the main reason for this are stated (the same as in the evaluation of the PR workers) as the least relevant reason. A detailed view on the respondents' answers is also interesting. Three journalists admitted that they had published a PR material as their own contribution. As the reason for this they stated their busyness and positive relationships with PR workers. One of them openly confessed non-professional attitude. All of them have been in the area of journalism more than 10 years. One of the respondents commented the situation: "it is a usual thing, that is why it is a PR article – the point is the quality. The problem is not in the content, but in the form", another one stated: "I don't think that journalists sign PR with their own names". The differentness illustrates the controversy of the theme and inconsistence of reactions [2].

4. Conclusion

The contribution offers a view on the issue of dynamic development of media environment with regard to possibility to use PR materials as a specific informative tool. The challenge was to write a text providing interdisciplinary perspective on the problem, which has been (because of many reasons) unnoticed.

Accepting the uniqueness of media space we remind ourselves that journalism has been traditionally profiled as an area with high professional ideals, which are not in accordance with practical achievements of journalists. Public, professionals, as well as practitioners from the area of media point out non-standard examples of the activities of journalists and media workers. Together with the poor quality of texts and the lack of investigation, they criticize non-standard relationships with PR people. To advocate journalism one may say that in comparison with PR, journalism is considerably financially undersized. This may lead to different kinds of "cooperation" between journalists and PR workers (sometimes the problem is not the "step over" of journalists toward PR workers, but also back to media environment).

Regarding the theme several researches have been realized showing some models of relationships between journalism and PR. Some of them point out the fact that PR determined journalism and that there is a mutual interconnection between PR and journalism, which has also been proven in our research (mainly by means of the interviews and the last question in questionnaire, in which the respondents openly expressed their opinion on the questionnaire and relationships between PR workers and journalists).

It is necessary to realize the status of both disciplines in media space and to intensify our perception of reality proving the fact that there is no partnership (in its real meaning). The questions such as how often, how much and in what way media use advertising materials and press releases must be relevantly answered. The reason is that PR is a specific area as its results are immeasurable. There are some specialists who document the results by the quantification of the spatium in media (the calculation in squared centimeters), but these numbers may not be (and are not) authoritative, as the spatium of a PR material does not correspond to the publicity reached by it [3] (and finally, PR itself is not just about "media relations").

In our research we have noticed that if journalists use a TS as a source, they do not change its original text. They paraphrase the title, copy particular parts (some of them are slightly amended afterwards) and modify the structure. The equivalence with the prototext is more than 30 %.

This finding corresponds to the attempt of PR workers to use the methods of journalists which results in qualitatively high-written and professional texts (attributes of the inverted pyramid, "human touch", story). This is proven by the journalists' opinions from the questionnaire, as well as by the interviews with PR workers.

Press releases are interesting also from their thematic point of view. The influence of a theme on TS selection as an informative source is essential regarding the theory of gatekeeping (with an emphasis on "human touch"). Commonly used press releases are from political environment (specifically those having the character of scandals and suspicions). These are followed by the TS from the area of edifying activities and culture. The least common TS have economic character.

According to PR workers and journalists (self-critically), the most common reasons of the penetrating of PR information into the area of media are busyness and non-professionalism of journalists. By means of the questionnaire and interviews and concerning different theories, we have explored the opinions of practitioners on the relationship between PR and journalism. None of the journalists thinks that journalists depend on PR, 8 PR workers think that journalists are dependent on PR, but both professions usually agree on the fact that their relationship is equal.

Nowadays, it is necessary for both professions to realize that PR is at the peak of its expansion and it is and will be an important

informative source for journalism. On the other hand, media space and journalists is a very dynamic organism, full of people with ambitions to work professionally, and therefore there is a high probability that the tries to set the clear rules for the work with PR materials remain a crucial theme of journalists.

Likewise, it will be important to identify limits between PR and journalism, as some of the journalists' answer and PR workers indicate that some practitioners consider PR publishing as standard editorial method.

Even from this point of view our research represents an insight into the media environment. Considering the situation of media, journalism and public relations in Slovakia, as well as the fact that the issue has been worked out only from the perspective of particular disciplines and not interdisciplinary, our research may be even more inspirational. Moreover, some of the professionals remind us that even the research from the field of public relations should have more precise methodological research and should provide not only the answers to solve practical problems (media relations, media trainings, techniques and tools of PR, ...).

For these reasons, it is necessary in this period when the importance of PR is growing (the number of PR workers is increasing, we may talk about so called marketing communicative mix), to deal with this practical discipline also from the academic perspective.

The research may be an inspiration and background for further – more detailed-conceived researches, for the character of this kind of researches requires higher personal and financial provisions.

PR and journalism are in a very interesting and equal relationship of their interdependence and competition and PR is and will be a meaningful, but a specific source. Professional level of a journalist remains his/her essential attribute, as well as his/her ability to distinguish credible and objective information [2].

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Lydia Kontrova – Tomas Lengyelfalusy – Dana Lengyelfalusyova *

A STATISTICAL ANALYSIS OF THE EFFECTIVENESS OF SELECTED METHODS IN THE TEACHING OF MATHEMATICS

We present the results of pedagogical experiment, which has verified the effectiveness of three teaching procedures used to teach selected units of secondary school mathematics. The primary experiment was preceded by a pilot survey realized among 200 first-grade students of the University in Zilina. The aim of the survey was a determination of the degree of contingency between two qualitative signs: the level of understanding mathematics and the teaching style in the teaching of mathematics. Regarding the obtained results the statistical methods of the single-factor analysis of variance for balanced model and Duncan's multiple range test were used to specify the most effective teaching method. The results of the experiment unambiguously confirm the teaching supported by the use of information technologies as the most effective method in the teaching of mathematics.

Keywords: *pedagogical experiment, teaching method, information technologies, qualitative research, contingency coefficient, one-factor dispersion analysis, Duncan's multiple range test, observability of the effectiveness of teaching methods.*

1. Introduction

The problem of students' understanding and mastering mathematics is currently one of the most emphasized topics of expert public discussion. New ways of teaching mathematics more effectively and attractively are being searched for. The information society brings new alternatives nowadays; it enables us to change established and rigid forms and methods in teaching. The veracity of a statement that the integration of information technologies into the process of education means the advent of new era of effective teaching and learning has been already proved by numerous research projects here and abroad. Many of them, for example [1], have verified the hypothesis claiming the possibility of computers to change out-of-date pedagogical approach and improve the results of students radically.

However, the technologies themselves are not all-powerful and the informatization of pedagogical process only is not enough. While trying to achieve better results it is necessary to appeal to the change of learners' attitude, their personal engagement and motivation. Only the synchronization of modern technologies together with student activity and participation can lead to better results in mathematical education.

2. Pilot survey – the teaching style matters!

While searching an answer to the question why the student attitudes toward mathematics are so often negative and what could influence this situation in a positive way, we conducted a survey realized under the program ITMS *Flexible and attractive study at the University of Zilina for the needs of the market and knowledge-based society.*

The paper presents one of the partial outcomes, which has ensued from the data obtained in the project realization. 200 students from three faculties of the University in Zilina were addressed in the survey (Faculty of Civil Engineering, Faculty of Operation and Economics of Transport and Communications, Faculty of Special Engineering), in which their attitudes toward mathematics were detected as well as the factors determining these attitudes. The obtained results were used to formulate a hypothesis: *the teaching style of mathematics has a significant influence on learning results in mathematics.*

Regarding $n = 200$ we observed two qualitative characters A and B, which took 5 levels.
Character A denotes *the teaching style of mathematics (how perceived by students: appropriate - impropriate).*
Character B denotes *students' level of understanding mathematics.*
Character A takes the categories A_1 = excellent, A_2 = very good, A_3 = sometimes convenient, sometimes inconvenient, A_4 = mostly inconvenient, A_5 = absolutely inconvenient.
Character B takes the categories B_1 = subject matter always understood, B_2 = subject matter understood most of the time, B_3 = subject matter understood on 50% of lessons, B_4 = subject matter rarely understood, B_5 = subject matter never understood.

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In relation to the observed categories we have acquired these absolute frequencies:

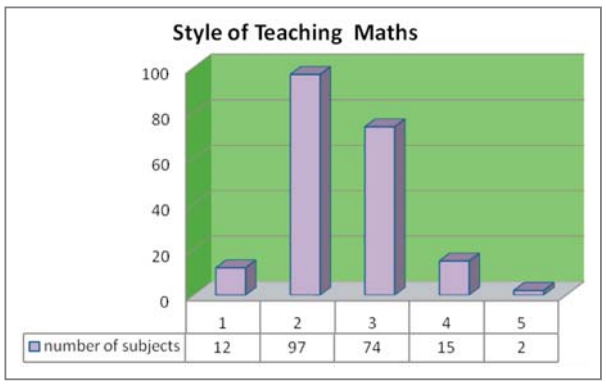

Fig. 1 The observed frequencies of the character A

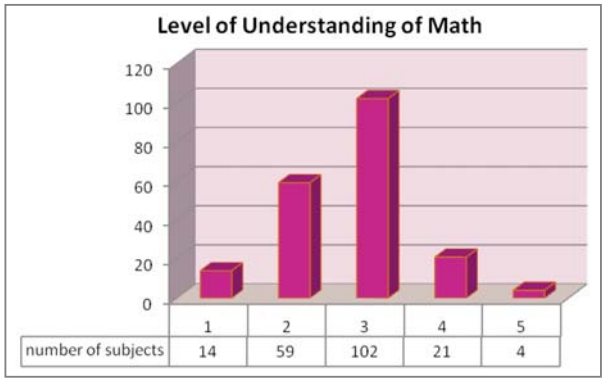

Fig. 2 The observed frequencies of the character B

We tested the hypothesis H_0 on the independence of observed characters *A* and *B*.

The data acquired from the *Fig. 1* and *Fig. 2* were used to configure the contingency table (*Table 1*) for qualitative research of observed characters:

Contingency Table of The Observed and Expected Frequencies — Tab. 2

$A \setminus B$	B_1	B_2	⋯	B_m	f_i^A
A_1	$f_{11}(o_{11})$	$f_{12}(o_{12})$	⋯	$f_{1m}(_{1m})$	f_1^A
A_2	$f_{21}(o_{21})$	$f_{22}(o_{22})$	⋯	$f_{2m}(o_{2m})$	f_2^A
⋮	⋮	⋮	⋮	⋮	⋮
A_k	$f_{k1}(o_{k1})$	$f_{k2}(o_{k2})$	⋯	$f_{km}(o_{km})$	f_k^A
f_j^B	f_1^B	f_2^B	⋯	f_m^B	n

We put the data into the *Table 2*: f_{ij} – the observed frequencies and o_{ij} – the expected frequencies of the characters *A* and *B* for $i = 1, 2, 3, 4, 5, j = 1, 2, 3, 4, 5$.

We counted the values as follows:

$f_i^A = \sum_{j=1}^{5} f_{ij}$ a frequency of a category A_i of the character *A*, $i = 1, 2, 3, 4, 5,$

$f_j^B = \sum_{i=1}^{5} f_{ij}$ a frequency of a category B_i of the character *B*, $j = 1, 2, 3, 4, 5,$

$n = \sum_{i=1}^{5}\sum_{j=1}^{5} f_{ij},$

and the expected frequencies $o_{ij} = \frac{f_i^A \cdot f_j^B}{n}$ for $i = 1, 2, 3, 4, 5$, $j = 1, 2, 3, 4, 5$.

We get the contingency table in the form:

The statistic chi-squared test χ^2 was used as a criterion for testing, given as

$$\chi^2 = \sum_{i=1}^{5}\sum_{j=1}^{5} \frac{(f_{ij} - o_{ij})^2}{o_{ij}} \qquad (1)$$

Test statistic has χ^2 division with the number of degrees of freedom $r = 16$. The verified hypothesis H_0 is rejected at the significance level $\alpha = 0.01$, if the value of tested criterion is $\chi^2 > \chi^2_{0.01}(16)$. The critical value is $\chi^2_{0.01,\ kritik}(16) = 32.1$.

The Contingency Table — Tab. 1

A – the teaching style of mathematics	B – level of understanding mathematics					
	Subject matter always understood	Subject matter understood most of the time	Subject matter understood on 50% of lessons	Subject matter rarely understood	Subject matter never understood	Σ
Excellent	1 (0.84)	7 (3.54)	3 (6.12)	1 (1.26)	0 (0.24)	12
Very good	8 (6.79)	27 (28.6)	52 (49.5)	9 (10.1)	1 (1.94)	97
Average	2 (5.18)	23 (21.8)	40 (37.7)	7 (7.77)	2 (1.48)	74
Mostly inconvenient	2 (1.05)	2 (4.4)	7 (7.65)	41 (1.57)	0 (0.3)	15
Absolutely inconvenient.	1 (0.14)	0 (0.6)	0 (1.1)	0 (0.2)	1 (0.04)	2
Σ	14	59	102	21	4	200

For the calculation of test statistic's value the Excel program was used. By putting the CHITEST function for the enter data and at the output configuration we obtained the value $\chi^2 = 45.156$ and the value of probability $p = 0.000131$. As $p < 0.01$ on the significance level $\alpha = 0.01$, we reject the hypothesis on the independence of observed characters. This means that the teaching style of mathematics has a *statistically significant influence on the level of understanding mathematics*.

The degree of statistical dependence between the observed qualitative characters *A, B* was consequently analyzed by the contingency coefficient defined by the formula:

$$C = \sqrt{\frac{\chi^2}{n + \chi^2}}. \qquad (2)$$

The value of the contingency coefficient is

$$C = \sqrt{\frac{45.156}{200 + 45.156}} \cong 0.439$$

From the calculated value of the contingency coefficient *C* ensues the fact that there is a mild degree of interconnection between the teaching style of mathematics and the level of understanding mathematics.

3. A method is not the method

The results of qualitative analysis of the characters *A* and *B* confirm ambiguously the significant influence of a teaching method on the level of knowledge acquired during teaching mathematics. So the myths that *mathematics is inborn or one can master mathematics and another cannot* are partially disproved [2].

Mathematics is a specific subject. To have a number of relevant information, to know the facts or isolated terms, to recall mathematical sentences, definitions or formulas is only the first step. The cardinal necessity is to understand their mutual context, which is the only source of true knowledge also applicable in reality.

Fig. 3 The scheme of cognitive process

If we want to progress in the field of teaching mathematics, we need to use the methods, forms and means of teaching, which would motivate students to be active, creative and engaged. As written by Piaget, 50 years of experimenting has taught us that there is no knowledge resulting only from the recording of observed phenomena without being structured by the activity of learner [3].

These indicia led our realization of a key pedagogical experiment, which was conducted at three secondary schools in the Zilina region. The experiment has confirmed the relevant influence of one of three applied teaching methods on the effectiveness of teaching mathematics. It has also shown the fact that if the teaching method is convenient and the means and forms of education are appropriate, the effectiveness of teaching increases and the learning results improve.

In connection with the results of the pilot survey we compared the effectiveness of three different teaching methods *A*, *B* and *C*.

- *Method A:* Dynamic form of teaching, the classwork was conducted in a computer classroom. Students actively participated in the process of discovering new mathematical terms. The aim of the activities realized at the lessons of mathematics was a creative search of answers, revealing of terms' interconnection and learning by doing [4].
- *Method B:* Teaching supported by the use of information technologies; these were used mainly by the teachers for a showy and effective visualization and presentation of curriculum; (Power Point presentations, animations, mathematical applets).
- *Method C:* Classical transmissive teaching in which traditional teaching means were used, e. g. explanation of curriculum by the teachers, work with textbook, workbook or board.

For the purposes of the experiment we randomly chose the group of 84 students from the 5th grade of 8-year secondary grammar schools from the Zilina region. The group was further divided into three groups of 28 students. All the students were taught the following thematic unit: *Linear functions, equations and inequalities.* The number of lessons, scope and content were the same for each group. The students wrote a test afterwards, which consisted of 15 tasks. The tests were evaluated and the results were presented in points (the maximum number of points was 35). The results are entered into the Table 3.

For a statistical evaluation of the results obtained in the experiment we used one – factor dispersion analysis. We expected that the level of the mean of three basic complexes depends on one factor – teaching style of mathematics taking three ranks.

For an application of the statistical method of one – factor dispersion analysis three conditions were necessary:

a) Selected samples come from basic complexes with normal division.
b) Selected samples are independent.
c) Dispersions of basic complexes are equal.

The observed character *X* denoted the level of students' knowledge reached in the posttest. The measured values represent the realization of mutually independent and random selections from the basic complexes, in which the observed sign *X* has a normal division $N(\mu_1, \sigma_1^2)$, $N(\mu_2, \sigma_2^2)$, $N(\mu_3, \sigma_3^2)$.

μ_1 denotes the average level of students' knowledge taught by the teaching method *A*,

μ_2 denotes the average level of students' knowledge taught by the teaching method *B*,

Results of the tests in points Tab. 3

Student	Experimental group		
	Group A	Group B	Group C
1	31	21	21
2	26	19	18
3	31	31	23
4	21	13	20
5	16	20	12
6	32	19	23
7	19	20	19
8	33	31	21
9	34	31	20
10	23	18	15
11	19	21	14
12	20	17	32
13	17	16	34
14	33	32	19
15	34	11	25
16	28	29	20
17	27	19	19
18	10	34	12
19	23	18	19
20	17	14	13
21	18	16	11
22	21	11	19
23	24	19	25
24	19	15	31
25	19	12	10
26	21	11	33
27	35	34	12
28	34	19	21
Average $\bar{x}$	24.42857	20.39286	20.0357

μ_3 denotes the average level of students' knowledge taught by the teaching method *C*.

To verify the first condition – the selected samples come from the basic sample with normal division, the Shapiro-Wilk test for the distribution of a random variable $n \in \langle 7{,}30 \rangle$ was used. The test confirmed the normality of selective complexes [6].

The second condition – the selected samples are independent, was accomplished in relation to the construction of random variables.

For the verification of the third condition – the dispersions of basic samples are equal – we used the Cochran *G* – test for the equality of dispersions [5].

We tested the hypothesis H_0: the dispersions of basic sample are the same, versus to H_1: the dispersions of basic samples are different.

We test characteristics *G* that are given as

$$G = \frac{\max\left(s_1^2, s_2^2, \ldots, s_m^2\right)}{\left(s_1^2 + s_2^2 + \ldots + s_m^2\right)}. \tag{3}$$

S_j is the standard deviation of data set j and $G_{\alpha,\, m,\, n-1}$ is the tabulated critical value.

The verified hypothesis H_0 is rejected at the significance level $\alpha = 0.01$, if the value of tested criterion $G \geq G_{\alpha,\, m,\, n-1}$.

$G_{0.01,\, m,\, n-1} = 0.4748$ is the tabulated critical value for $m = 3$ and $n - 1 = 27$ the number of degrees of freedom.

The value of the testing characteristics $G = 0.374$.

Hypothesis H_0 is not rejected at the significance level $\alpha = 0.01$. The assumption of the equality of dispersions for all three basic samples has been proved.

After the verification of conditions a) – c) we preceded to the one – factor analysis of variance for balanced attempt as the compared samples have normal dispersion and the dispersions of basic samples are equal.

Tested hypothesis:

$H_0 : \mu_1 = \mu_2 = \mu_2$ versus to the alternative hypothesis

H_1: not all μ_i are equal providing the dispersion equality σ_1^2, σ_2^2, σ_3^2.

As for the spans n_1, n_2, n_3 of selected samples $n_1 = n_2 = n_3 = n = 28$ we used the one-factor Analysis of Variance of balanced model. The calculation was realized in the MS Excel program. We employed ANOVA function for the significance level $\alpha = 0.05$.

The output table of the one-factor analysis of variance consists of two parts; the values of descriptive characteristics of specific factor levels are calculated in the first part (size of the samples, average and dispersion of the samples).

The second part contains total sum of squares (*SS*), the numbers of degrees of freedom (*df*), the mean square of variance (*MS*), the value of testing criteria $F = 3.4361$ and the critical value $F_{crit}\,(2.82) = 3.1093$.

As $F > 3.109$ is valid, we reject the H_0 hypothesis at the significance level $\alpha = 0.05$, which means that the effectiveness levels of three teaching methods A, B and C are significantly different. The same result is obtained by the use of the value *Value P*. As the value $P = 0.0369$, the value of error we get if the null hypothesis is rejected is approximately 3.6%, which is allowable error rate at the significance level $\alpha = 0.05$

We summarized of the obtained data:

ANOVA *One Factor*

Anova table – the values of the descriptive characteristics Tab. 4

Groups	Count	Sum	Average	Variance
Group A	28	684	24.4285	47.6613
Group B	28	571	20.3928	53.6547
Group C	28	561	20.0357	44.1838

Anova table – second part Tab. 5

Source of Variation	*SS*	*df*	*MS*	*F*	*P* - value	*F*-crit
Between Groups	333.3095	2	166.65	3.4361	0.0369	3.1093
Within Groups	3928.5	81	48.5			
Total	4261.81	83				

We were also interested in the fact which two of three used methods are significantly different in their effectiveness. The MS Excel program does not operate with statistical programs for these kinds of file comparisons, therefore we used Duncan's test for the statistical significance of contrasts.

The average numbers of points were arranged according to their size:

$$\bar{x}_1 = 24.42;\ \bar{x}_2 = 20.39;\ \bar{x}_3 = 20.03$$

The value of tested criterion was calculated, given S_r^2 as a residual dispersion

$$\sqrt{\frac{s_r^2}{n}} = \sqrt{\frac{48.5}{28}} = 1.31$$

The relevant tables were used for the determination of critical values of Duncan's test $D_{0.05}$ for the significance level $\alpha = 0.05$ for given p and given residual number of degrees of freedom $84 - 3 = 81$. These data were entered into the Table 5 together with the calculated values $D_{p,\alpha}$.

The critical values of Duncans test Tab. 6

p	$D_{0,05}$	$D_{p,\alpha} = D_{0,05}$
2	2. 814	3. 686
3	2. 961	3. 878

By the means of these characteristics we tested statistical significance of the particular arithmetic averages

We tested the following differences:

For the difference $\bar{x}_1 - \bar{x}_3$ we got:
$p = 3$, $D_{p,\alpha} = 3.878$. As $\bar{x}_1 - \bar{x}_3 = 4.39 > 3.878$ difference is significant.

For the difference $\bar{x}_1 - \bar{x}_2$ we got:
$p = 2$, $D_{p,\alpha} = 3.686$. As $\bar{x}_1 - \bar{x}_2 = 4.03 > 3.878$ difference is significant.

For the difference $\bar{x}_2 - \bar{x}_3$ we got:
$p = 2$, $D_{p,\alpha} = 3.686$. As $\bar{x}_2 - \bar{x}_3 = 0.37 < 3.878$ difference is not significant.

The testing showed that the teaching method *A* is more effective than the methods *B* and *C*.

4. Interpretation of the results

The innovative teaching used in education was proved by the statistical testing as a convenient means to increase students' performance in mathematics. We afford to say that the results are sufficient enough to accept the claim that the students taught by the innovative method *A* and actively using the information technologies, acquired more competencies from the curriculum than the students taught by the methods *B* or *C*.

The experimental method proved itself as valid and reliable. The results of experiment clearly indicate that the integration of information technologies into the educational process is not sufficient if it is not accompanied by the participation of students and their active engagement in the process of education. Otherwise we may talk only about showy teaching, but not about effective teaching.

The sample size used for testing does not authorize us to generalize our statement. However, we may conclude that the results obtained in the experiment are in consonance with the results of similar researches, such as Tall's research [4].

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Dusan Mamrilla – Gabriela Kravcakova *

COEFFICIENT OF EFFICIENCY IN PEDAGOGICAL AND SCIENTIFIC WORK OF A TEACHER AND A GROUP OF UNIVERSITY TEACHERS

Financial resources are provided for realization of pedagogical performance (PP) and scientific performance (SP) at the university. Efficiency of its usage is subject of research for many researchers. In this paper we show practical quantification model of PP and SP of university teacher and university organizational units (i.e. groups of teachers, university department, groups of departments, faculty, groups of faculties, university). We respect recommended expenditure ratio PP : SP = 60 : 40 of provided financial resources.

Key words: *Coefficient of Efficiency, Measurability of Pedagogical and Scientific Work, University Teacher.*

1. Introduction

Coefficient of Efficiency $E = \frac{Input}{Output}$ of an aggregated basic university teacher's work performance per one academic year is studied using analytical methods and graphic instruments with regard to equilibrium $E = 1$. If $E < 1$ then the value of performance is lower than invested financial resources and it is necessary to seek the cause of such negative occurrence. If $E > 1$ then the proven work performance of university teacher or organisational unit should be additionally appreciated, although norms should not be increased. Expected equilibrium $E = 1$ might exhibit certain signs of instability if unit quality (balanced, standardized) *PP* (*SP*) for performance evaluation is set incorrectly.

2. Measurability of the basic pedagogical performance

Quality of university teacher's *PP* per one academic year is defined by the following formula:

$$PP = \sum_i (NSG)_i (NSC)_i + \sum_j (NDT)_j (NSC)_j + \\ + \sum_k (NMT)_k (NSC)_k + \sum_l (NBT)_l (NSC)_l + \\ + \sum_m (NPG)_m (NSC)_m ,$$

where *NSG* is number of supervised study groups, *NDT* is number of supervised dissertation theses, *NMT* is number of supervised master theses, *NBT* is number of supervised bachelor theses, *NPG* is number of supervised scientific, professional and artistic activity groups and *NSC* is number of standard credits. Proposed number of standard credits is indicated in the Table 1. In the brackets after the number of standard credits *NSC* next to each item is indicated number of optimal occurrences *NOO* of given item (in total maximum of points):

Suggested number of standardised credits (formula for *PP*) Tab. 1

	NSG	*NDT*	*NMT*	*NBT*	*NPG*
NSC (*NOO*)	4 (5)	12 (1)	6 (2)	4 (3)	4 (1)

3. Measurability of basic scientific performance

Quality of university teacher's *SP* per one academic year is defined by the following formula:

$$SP = \sum_i (NPM)_i (NSC)_i + \sum_j (NSA)_j (NSC)_j + \\ + \sum_k (NPA)_k (NSC)_k + \sum_l (NRP)_l (NSC)_l + \\ + \sum_m (NQP)_m (NSC)_m ,$$

where *NPM* is the number of published scientific and professional monographs, *NSA* is the number of published scientific articles, *NPA* is the number of published professional articles, *NRP* is the number of reviewed scientific and professional papers, *NQP* is the number of cited scientific and professional papers, *NSC* is the number of

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standard credits. Proposed number of standard credits is indicated in the Table 2. In the brackets after the number of standard credits *NSC* next to the each item is indicated number of optimal occurrences *NOO* of given item (in total maximum of 40 points if we do not include separately evaluated item *NPM*):

Proposed number of standardized credits (the formula for *SP*) Tab. 2

	NPM	*NSA*	*NPA*	*NRP*	*NQP*
NSC (*NOO*)	20 (1)	15 (1)	10 (1)	5 (2)	5 (1)

If university teacher receives at least 60 points for the basic pedagogical performance *PP* and 40 points for basic scientific performance *SP* then the set criteria were met and we can conclude that standardized basic work performance was achieved. Formulas for *PP* and *SP* may be modified if the ratio $PP : SP = 60 : 40$ is maintained.

Pedagogical university teacher's performance *PP* can be specified in a greater detail, however quality level and optimal quantification of operations noted below are subjects to further research and its results are beyond capacity of this article. Here we present only a list of possible items [4].

4. Direct pedagogical activities:

Lecturing in full-time study programmes; facilitating seminars and workshops in full-time study programmes; lecturing (consulting) in doctoral studies; leading consultations in part-time study programmes; leading excursions and internship programs for students.

5. Indirect pedagogical activities:

preparation of lectures for full-time study programmes; preparation of seminars and workshops for full-time study programmes; consulting hours for students (personal and electronic); preparation of lectures (consultations) for doctoral studies; preparation of consultations for part-time study programmes; development of tests, exam papers and tasks for semester and final evaluation of students; evaluation of full-time and part-time students during the semester (evaluation of course papers, projects, etc.); final evaluation of full-time and part-time students; examination of doctoral students at the end of course syllabus; membership in a state exam commission; membership in rigorous commission; membership in commission for examination of doctoral students; supervision of bachelor theses; supervision of master theses; supervision of rigorous theses; supervision of dissertation theses; revision of bachelor theses; revision of master theses; revision of rigorous theses; revision of dissertation theses; revision of habilitation and inauguration papers; management of SR&DA (Student research and development activities) and other activities related to the pedagogical activities (record of results of passing a subject in academic information system, creation of themes for theses, preparation of written materials for students, etc.).

Scientific university teacher's performance *SP* can be specified in a greater detail. E.g. we could take into account percentage share of an author in publications with more than one author as [2] and [3] are. However quality level and optimal quantification of operations noted below are subject to further research and its results are beyond capacity of this article. Here we present only a list of possible items.

6. Scientific research and publication activities:

Creation of a scientific monograph; chapters in scientific monographs; academic textbook creation; chapters in academic textbooks; scientific articles in journals; almanacs and monographs; presentations in the conferences; reports about solved scientific research tasks; copyright certificates, patents and inventions; published professional books; chapters in professional books; textbooks for primary and secondary schools; lecture scripts and notes; chapters in lecture scripts and notes; professional articles in journals and almanacs; abstracts, posters, slogans in technical terminology dictionaries, standards, norms, translations; audio-visual works, works of art; reviews, reports about research projects; leading the team of authors creating monographs, textbooks, lecture scripts and notes; implementation of research activities; management of grant and non-grant projects (departmental, faculty, etc.) – team management, administration; membership in a scientific school council; membership in a commission for study fields and joint commissions for study fields; membership in a committee for project review; membership in an editorial board of a journal; other activities connected with scientific research (project development, organizational work, conference management).

7. Other activities:

learning new knowledge; field of study supervisor; course coordinator; member of rector's advisory board; member of dean's advisory board; member of an accreditation committee (of ministry, school, work group); member of the Academic Senate; position in the Trade Union; Head of Department; Deputy Head of Department; Department Secretary; training activities in the faculty (university of 3rd age, professional training courses and seminars); departmental meetings; ESF project coordinator; ESF project team member.

8. The Coefficient of efficiency

The item *Output* in the formula for the Coefficient of efficiency *E* of an aggregated basic university teacher's work performance per one academic year can be determined by the formula:

$$Output = \frac{PP + SP}{100} ATW,$$

where *ATW* is an annual tariff wage (gross) determined by statute or other linking regulation.

The item *Input* in the formula for the Coefficient of efficiency *E* of an aggregated basic university teacher's work performance per one academic year can be determined by the formula:

$$Input = ATW + BNF,$$

where *BNF* are financial benefits (gross) received above the framework *ATW*.

The Coefficient of efficiency *E* of an aggregated basic university teacher's work performance per one academic year can be determined by the formula:

$$E = \frac{Output}{Input} = \frac{PP + SP}{100} \frac{ATW}{ATW + BNF} .$$

In general, the Coefficient of efficiency $E = \frac{PP + SP}{100} \cdot \frac{ATW}{ATW + BNF}$ is applied to a range of university teachers by a function of four independent real variables *PP*, *SP*, *ATW* and *BNF* where $PP \geq 0$, $SP \geq 0$, $ATW > 0$, $BNF \geq 0$, $E \in [0, \infty)$. Balanced state $E = 1$ occurs, for example, when (*PP, SP, ATW, BNF*) = (60, 40, *ATW,* 0).

If we assume that $BNF = 0$ then $E = \frac{PP + SP}{100}$ The performance of university teacher can be stated in percentage, it applies that $E(\%) = (PP + SP)\frac{ATW}{ATW + BNF}$, respectively $E(\%) = PP + SP$ if $BNF = 0$.

9. The specific model situation and its evaluation

Suppose that the organisational unit of university consists of $n \geq 1$, $n \in N$ teachers. This may be one teacher, a group of several professors, several associated professors, several associates, several assistants in the department, but also a group of all teachers in the department, and so forth.

The Coefficient of efficiency *E* of the aggregated basic university teacher's work performance ($n = 1$, $i = 1$) and of a group of university teachers ($n > 1$, i = 1, 2, ..., n) per one academic year, provided that the value of the group member's performance $PP + SP$ is comparable, can be determined by the formula:

$$E = \frac{Output}{Input} = \frac{\sum_i \left((PP)_i (SP)_i\right)}{100n} \frac{\sum_i (ATW)_i}{\sum_i \left((ATW)_i (BNF)_i\right)},$$

where the expression $\frac{\sum_i \left((PP)_i (SP)_i\right)}{100n}$ represents the mean value of random variable $X = \frac{(PP)_1 + (SP)_1}{100}, \frac{(PP)_2 + (SP)_2}{100}, \ldots, \frac{(PP)_n + (SP)_n}{100}$, the expression $\sum_i (ATW)_i$ represents the sum of tariff wages of all members of a group of university teachers per one academic year, the term $\sum_i \left((ATW)_i + (BNF)_i\right)$ represents the sum of the annual tariff wages and financial benefits of all members of a group of university teachers per one academic year.

The Coefficient of efficiency *E* of the aggregated basic university teacher's work performance ($n = 1$, $i = 1$) and of a group of university teachers ($n > 1$, i = 1, 2, ..., n) per one academic year, provided that the value of the group member's performance $PP + SP$ is not comparable, can be determined by the formula:

$$E = \frac{Output}{Input} = \frac{\sum_i \left(\frac{(PP)_i + (SP)_i}{100} (ATW)_i\right)}{\sum_i \left((ATW)_i + (BNF)_i\right)}.$$

The Coefficient of efficiency *E* of the aggregated basic university teacher's work performance ($n = 1$, $i = 1$) and of a group of university teachers ($n > 1$, i = 1, 2, ..., n) per one academic year, provided that the value ($ATW + BNF$) of the group members is comparable and the random variable $Y = (E_1, E_2, ..., E_n)$ represents such Coefficients of efficiency of the aggregated basic university teacher's work performance within considered group that belong to normal statistical distribution can be determined by the formula:

$$E = \frac{1}{n} \sum_i E_i \text{ or } E = median(Y).$$

University may determine its own optimal level $E_0 \leq 1$ for the Coefficient of efficiency of the aggregated basic university teacher's work performance or of a group of university teachers per one academic year.

Employee whose Coefficient of efficiency is $\check{E}$, $\check{E} \leq E_0$, can be loaded by one time cash compensation x, $x \geq 0$ (reduction of $\check{E}$ to E_0):

$$E_0 = \frac{PP + SP}{100} \frac{ATW}{ATW + BNF - x},$$

$$x = BNF + \left(1 - \frac{PP + SP}{100E_0}\right) ATW.$$

Employee, whose Coefficient of efficiency is $\hat{E}$, $\hat{E} \geq E_0$, can be rewarded by one time cash compensation y, $y \geq 0$ (reduction of $\hat{E}$ to E_0):

$$E_0 = \frac{PP + SP}{100} \frac{ATW}{ATW + BNF - y},$$

$$y = -BNF + \left(\frac{PP + SP}{100E_0} - 1\right)ATW.$$

10. Example for calculating the Coefficient of efficiency and the amount of monetary compensation

Consider the model situation according to Table 3 for two employees *Empl*1, *Empl*2.

Calculate the Coefficient of efficiency E_1 of the aggregated basic work performance of the employee *Empl*1 and the Coefficient of efficiency E_2 of the aggregated basic work performance of the employee *Empl*2.

Calculate the Coefficient of efficiency E_3 of the aggregated basic work performance of the group of employees *Empl*1 and *Empl*2 by applying the formula for comparable values $PP + SP$.

Calculate the Coefficient of efficiency E_4 of the aggregated basic work performance of the group of employees *Empl*1 and *Empl*2 by applying the formula for incomparable values $PP + SP$.

Calculate the Coefficient of efficiency E_5 of the aggregated basic work performance of the group of employees *Empl*1 and *Empl*2 by applying the formula for comparable values $ATW + BNF$.

Performance and income of workers Tab. 3

	PP	*SP*	*ATW*	*BNF*	*PP* + *SP*	*ATW* + *BNF*
*Empl*1	59	30	1000	200	89	1200
*Empl*2	56	48	1200	300	104	1500

Values *ATW* and *BNF* are presented in theoretical monetary terms. Then we have

$$E_1 = \frac{PP + SP}{100}\frac{ATW}{ATW + BNF} = \\ = \frac{89}{100}\frac{1000}{1200} \approx 0.741666666$$

$$E_2 = \frac{PP + SP}{100}\frac{ATW}{ATW + BNF} = \\ = \frac{104}{100}\frac{1200}{1500} = 0.832$$

$$E_3 = \frac{\sum_i \left((PP)_i + (SP)_i\right)}{100n}\frac{\sum_i (ATW)_i}{\sum_i \left((ATW)_i + (BNF_i)\right)} = \\ = \frac{89 + 104}{200}\frac{1000 + 1200}{1200 + 1500} \approx 0.786296296$$

$$E_4 = \frac{\sum_i \frac{(PP)_i + (SP)_i}{100}(ATW)_i}{\sum_i \left((ATW)_i + (BNF_i)\right)} = \\ = \frac{\frac{89}{100}1000 + \frac{104}{100}1200}{1200 + 1500} \approx 0.791851851$$

$$E_5 = \frac{E_1 + E_2}{2} = median(E_1, E_2) = \\ = \frac{0.741666666 + 0.832}{2} \approx 0.786833333$$

We can conclude from the calculations that the return of the invested financial resources in case the employee *Empl*1(*Empl*2) is at the level of 74.17%(83.20%).

The Coefficient of efficiency $E_3(\%)$ of the aggregated basic work performance of the group of employees *Empl*1 and *Empl*2, provided that the values $PP + SP$ of the group members are comparable, is on the level 78.63%.

The Coefficient of efficiency $E_4(\%)$ of the aggregated basic work performance of the group of employees *Empl*1 and *Empl*2, provided that the values $PP + SP$ of the group members are incomparable, is on the level 79.19%.

The Coefficient of efficiency $E_5(\%)$ of the aggregated basic work performance of the group of employees *Empl*1 and *Empl*2, provided that the values $ATW + BNF$ of the group members are comparable, is on the level 78.68%.

For given model situation applies that $E_3(\%) \approx E_4(\%) \approx \\ \approx E_5(\%) \approx 79\%$.

Consider that the optimum level of the Coefficient of efficiency of the aggregated basic university teacher's work performance per one academic year is the value $E_0 = 0.832$. Then the employee *Empl*2 deserves zero cash compensation $x_2 = 0$ and the employee deserves payroll deduction in a form of single monetary compensation x_1, $x_1 \geq 0$:

$$x_1 = BNF + \left(1 - \frac{PP + SP}{100E_0}\right)ATW = \\ = 200 + \left(1 - \frac{89}{83.2}\right)1000 \approx 130.2884615$$

of theoretical monetary units.

Consider that the optimum level of the Coefficient of efficiency of the aggregated basic university teacher's work performance per one academic year is the value $E_0 = 0.741666666$. Then the employee *Empl*1 deserves zero cash compensation $y_1 = 0$ and the employee *Empl*2 deserves payroll bonus in a form of single monetary compensation y_2, $y_2 \geq 0$:

$$y_2 = -BNF + \left(\frac{PP + SP}{100E_0} - 1\right)ATW =$$
$$= -300 + \left(\frac{104}{74.1666666} - 1\right)1200 \approx 182.6966307$$

of theoretical monetary units.

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PURSUIT CURVES AND ORDINARY DIFFERENTIAL EQUATIONS

This paper deals with the differential equations which describe curves of pursuit, in which the pursuer's velocity vector always points directly towards the pursued. We use the Laplace Transform method to solve the classic problem of four mice pursuit.

Key words: *pursuit curve, differential equation, the Laplace Transform method*

1. Introduction

A curve of pursuit is the path an object takes when chasing another object. The problem of pursuit probably originated with Leonardo da Vinci. He was the first one to study this problem when the pursued moved along a straight line. The general case was studied in 1732 by Pierre Bouguer (1698–1758), the French scientist. The problem deals with a pirate ship pursuing a merchant vessel. It is to find the curve by which a pirate ship moves while pursuing a merchant vessel, supposing that the speeds of the two vessels are always in the same ratio. Let us formulate this problem mathematically.

2. Definition

Let α and β be plane curves parametrized on an interval $a < t < b$. We say that α ***is a pursuit curve of*** *β provided that*

(i) *the velocity vector $\alpha'(t)$ points towards the point $\beta(t)$ for $a < t < b$, that is $\alpha'(t)$ is a multiple of $\alpha(t) - \beta(t)$,*

(ii) *the speeds of α and β are related by $\|\alpha'\| = k\|\beta'\|$, where k is a positive constant. We call k the* ***speed ratio****.*

A ***capture point*** *is a point* ***p for*** *which* $\mathbf{p} = \alpha(t_1) = \beta(t_1)$ *for some* t_1.

When the speed ratio k is larger than 1, the pursuer travels faster than the pursued. Although this would usually be the case in a physical situation, it is not a necessary assumption for the mathematical analysis of the problem.

We derive differential equations for pursuit curves in terms of coordinates.

Lemma. *Write $\alpha = (x, y)$ and $\beta = (f, g)$, and assume that α is a pursuit curve of β. Then*

$$(x')^2 + (y')^2 = k^2[(f')^2 + (g')^2] \tag{1.1}$$

and

$$x'(y - g) - y'(x - f) = 0. \tag{1.2}$$

Proof. Equation (1.1) is the same as $\|\alpha'\| = k\|\beta'\|$. To prove (1.2), we observe that $\alpha(t) - \beta(t) = (x(t) - f(t), y(t) - g(t))$ and $\alpha'(t) = (x'(t), y'(t))$. Note that the vector $(- y(t) + g(t), x(t) - f(t))$ is perpendicular to $\alpha(t) - \beta(t)$. The condition that $\alpha'(t)$ is a multiple of $\alpha(t) - \beta(t)$ is conveniently expressed by saying that $\alpha'(t)$ is perpendicular to $(- y(t) + g(t), x(t) - f(t))$, that is,

$$\begin{aligned} 0 &= (x'(t), y'(t)) \cdot (- y(t) + g(t), x(t) - f(t)) = \\ &= x'(t)\,(- y(t) + g(t)) + y'(t)\,(x(t) - f(t)). \end{aligned} \tag{1.3}$$

Then (1.3) is equivalent to (1.2).

Next, we specialize to the case when the curve of the pursued is a straight line.

3. Example 1

Assume that the curve β of the pursued is a vertical straight line passing through the point $(a, 0)$, and that the speed ratio k is larger than 1. Find the curve α of the pursuer, assuming the initial conditions $\alpha(0) = (0, 0)$ and $\alpha'(0) = (1,0)$.

Solution. We can parameterize β as

$$\beta(\mathrm{t}) = (a, \mathrm{g(t)}).$$

Furthermore, the curve α of the pursuer can be parametrized

$$\alpha(\mathrm{t}) = (t, y(t)).$$

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The condition (1.1) becomes

$$1 + (y')^2 = k^2(g')^2 \tag{1.4}$$

and (1.2) reduces to

$$(y - g) - y'(t - a) = 0. \tag{1.5}$$

Differentiation of (1.5) with respect to t yields

$$-y''(t - a) = g'. \tag{1.6}$$

From (1.4) and (1.6) we get

$$1 + (y')^2 = k^2(a - t)^2(y'')^2. \tag{1.7}$$

Let $p = y'$. Then (1.7) can be rewritten as

$$\frac{k\,dp}{\sqrt{1+p^2}} = \frac{dt}{|a-t|}. \tag{1.8}$$

This separable first-order equation has the solution

$$\operatorname{arg\,sinh}\big(p(t)\big) = \frac{1}{k}\ln\left|\frac{a-t}{a}\right|, \tag{1.9}$$

for $p(0) = y'(0) = 0$, $a \neq 0$, $t \neq a$, where $t \in (a, \infty)$ for $a < 0$, and $t \in (-\infty, a)$
for $a > 0$

$$\sinh\Big(\operatorname{arg\,sinh}\big(p(t)\big)\Big) = p(t) = y'(t) = \sinh\left(\ln\left|\frac{a-t}{a}\right|^{-\frac{1}{k}}\right) = \frac{1}{2}\left(\left|\frac{a-t}{a}\right|^{-\frac{1}{k}} - \left|\frac{a-t}{a}\right|^{-\frac{1}{k}}\right) \tag{1.10}$$

For $a < 0$ is $a - t < 0$, for $a > 0$ is $a - t > 0$, and

$$y'(t) = \frac{1}{2}\left(\left|\frac{a-t}{a}\right|^{-\frac{1}{k}} - \left|\frac{a-t}{a}\right|^{-\frac{1}{k}}\right),$$

$$y(t) = \frac{ak}{k^2-1} + \frac{1}{2}\left(\frac{ak}{k+1}\left(\frac{a-t}{a}\right)^{1+\frac{1}{k}} - \right.$$

$$\left. - \frac{ak}{k-1}\left(\frac{a-t}{a}\right)^{1+\frac{1}{k}}\right), for\ y(0) = 0 \tag{1.11}$$

The curve of the pursuer is then $\alpha(t) = (t, y(t))$, where y is given by (1.11). Since $\alpha(t_1) = \beta(t_1)$ if and only if $t_1 = a$, the capture point is

$$p = \left(a, \frac{ak}{k^2-1}\right). \tag{1.12}$$

The graph below depicts the case when $a = 1$ and k has the values 1.5, 2.0, 2.5, 3.0, and 3.5. As the speed ratio k becomes smaller and smaller, the capture point goes higher and higher [1].

Now we use the Laplace Transform method for solving to the classic four mice pursuit problem [2-4].

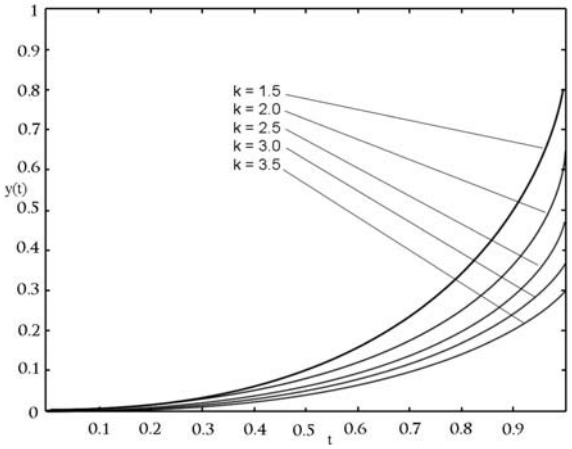

Fig. 1 Pursuit curves for the case when the pursued moves in a straight line

4. Example 2

Suppose four mice are located at each of the four corners of a square table, and each mouse runs toward the one to its right. Find the parametric curves that describe the trajectory of the mice. Realize of course, that the velocity of each mouse does not matter; they will still follow the same trajectory.

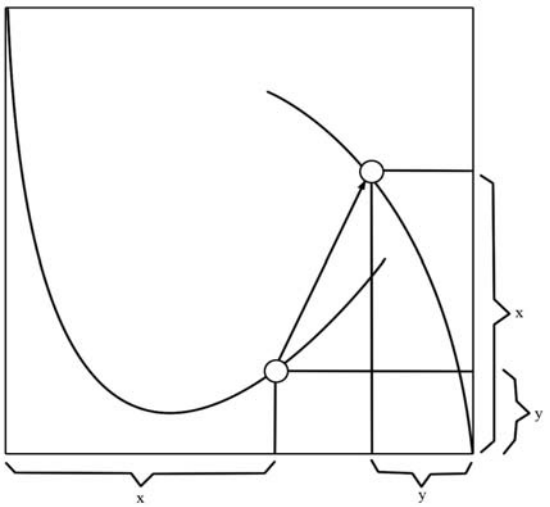

Fig. 2 Actual trajectory of two mice

Solution. We begin with a diagram of the mice on the table. Let the table be of size unity on each side and we concentrate on the bottom left mouse. We can express the slope of its present velocity vector as

$$\frac{dy}{dx} = \frac{x-y}{1-x-y}. \tag{2.1}$$

To introduce the parametric velocities, we can instead write

$$\frac{\frac{dy}{dt}}{\frac{dx}{dt}} = \frac{x-y}{1-x-y}. \qquad (2.2)$$

From (2.2) we have

$$\frac{dy}{dt} = x - y$$

$$\frac{dx}{dt} = 1 - x - y$$

Laplace transforming this set, and using the initial conditions $y(0) = 0$ and $x(0) = 0$,

$$sY(s) = X(s) - Y(s)$$

$$sX(s) = \frac{1}{s} - X(s) - Y(s).$$

Solving for $X(s)$ using the first equation, we have $X(s) = (s + 1)Y(s)$. Substituting this into the second, $s(s + 1)Y(s) = 1/s - (s + 1)Y(s) - Y(s)$.

Solving for $Y(s)$, and by a similar process for $X(s)$ and inverse transforming we have

$$y(t) = \frac{1}{2} - \frac{1}{2}e^{-t}\cos t - \frac{1}{2}e^{-t}\sin t$$

$$x(t) = \frac{1}{2} - \frac{1}{2}e^{-t}\cos t + \frac{1}{2}e^{-t}\sin t$$

And we are done. In this process, no calculus has been employed. The hardest part was the algebraic manipulation or looking up the transforms in a table. We may find the others by the same process, but using a different initial condition.

If $y(0) = 1$, this would make $y'(t) \to sY(s) - 1$, etc. If a geometric or symmetry argument is used, then each successive trajectory has as its y-component the current x-component, as its x-component one minus the current y-component. To write it all out,

$$x_1(t) = \frac{1}{2} - \frac{1}{2}e^{-t}\cos t + \frac{1}{2}e^{-t}\sin t$$

$$y_1(t) = \frac{1}{2} - \frac{1}{2}e^{-t}\cos t - \frac{1}{2}e^{-t}\sin t$$

$$x_2(t) = \frac{1}{2} + \frac{1}{2}e^{-t}\cos t + \frac{1}{2}e^{-t}\sin t$$

$$y_2(t) = \frac{1}{2} - \frac{1}{2}e^{-t}\cos t + \frac{1}{2}e^{-t}\sin t$$

$$x_3(t) = \frac{1}{2} + \frac{1}{2}e^{-t}\cos t - \frac{1}{2}e^{-t}\sin t$$

$$y_3(t) = \frac{1}{2} + \frac{1}{2}e^{-t}\cos t + \frac{1}{2}e^{-t}\sin t$$

$$x_4(t) = \frac{1}{2} - \frac{1}{2}e^{-t}\cos t - \frac{1}{2}e^{-t}\sin t$$

$$y_4(t) = \frac{1}{2} + \frac{1}{2}e^{-t}\cos t - \frac{1}{2}e^{-t}\sin t$$

The plot of the solution is given below.

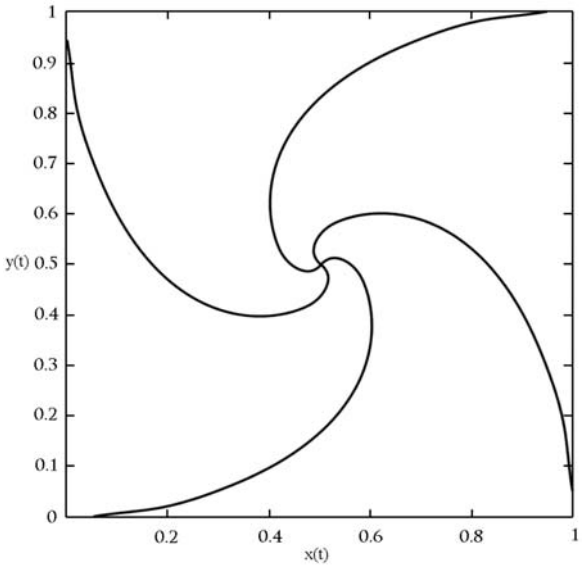

Fig. 3 The curves which describe the trajectory of four mice

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Michaela Bakay Zahorska *

THE FIRST SLOVAK-AMERICAN FRATERNAL ORGANIZATIONS AND PRESS

The aim of this work is to point out the characteristic features of the selected Slovak American fraternal organizations and Slovak press in the USA as the symbols of the raise of Slovak patriotism and the preservation of the Slovak cultural heritage .It provides the historical and political background of Slovak American immigration, settlement in the USA as well as the first political and fraternal activities that encouraged the Slovak nation to speak up for their rights and helped to awaken the Slovak interest in national issues, solidarity and a high sense of Slovak identity.

Key words: *Slovak American immigrants, fraternal organizations, immigration, press*

1. Introduction

The immigration, as social and demographic phenomena, has played an inherent part of the Slovak history over the centuries. The grounds for the immigration were usually marked by poor social, religious and economic conditions in Austrian-Hungarian Empire. Nowadays most Slovak Americans are descendants of immigrants who came to the US between the years 1865–1914.

We can recognize three main streams of Slovak immigration into the USA. The first stream dates back to late 1870s due to social, economic and educational reasons and due to the promise of prosperity, so called American dream. The second wave of immigration hit the USA between the years 1918–1938. Many immigrants took up the hardest jobs in coal mines or steel industry. Soon, America imposed the law to stop a large wave of immigration into the USA by setting a discriminatory immigration quota system which resulted in the larger immigration into Canada [1]. The take-over of Czechoslovakia by communists and Soviet Union's invasion purred another wave of immigration for political reasons. Most of immigrants were members of intelligentsia and post war figures who had to avoid a political persecution.

The main source of living for most Slovaks in the 19th century was agriculture. Many of them were day workers or small farmers who owned no land. Slovaks were poor peasants with poor education due to strong Hungarian efforts for language assimilation of other nations in Austro-Hungarian Empire. In the middle of the 19th century, Slovaks were accustomed to migrate to the nearby part of Austro-Hungarian Empire. When there was no other possibility to migrate in surrounding areas, they were forced to flee into America or Canada where the immigration was supported by the government due to heavy industrialization of the country. The most common areas of the settlement were New York, Pennsylvania, Ohio, Illinois, Connecticut, Florida, Iowa, Kansas and California. Most of these settlements represented the most industrialized parts of the USA with the high concentration of steel, coal and mine industries. The American employers were aware of the fact that Slovaks would not leave their job unless they earned enough money to return back home to Europe so the immigrant's wages were kept were low but still higher than in Austrian-Hungarian Empire.

The new life in America had brought the significant change in social, cultural and political activities of Slovak immigrants. From the underestimated people they developed to the nation aware of their national roots and linked together by their mutual needs and patriotism liberalized from the Hungarian oppression mostly in years 1848–1918. Soon after their arrival, the immigrants had understood their need for organizing for both protection and support in a foreign country. The Slovak priests became their religious, social and national leaders.

This article aims to provide the highlights of first political and national activities of Slovak immigrants in the USA. The Slovak fraternal organizations were created with intention to preserve Slovak and Czech culture, history, traditions as well as to help their members to adapt to American way of life. What is more they paved the path for the first Slovak press activities both in America and back home in Europe.

2. The first Slovak fraternal Organizations and their Political Activities

The Catholic religious traditions kept the Slovak immigrants together and supported their intentions to gather for both their

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protection and support. Many of them left their families and felt lonely. Soon, they started to group together and formed several organizations and societies of political, social cultural and economic benefits for their community. The fraternal benefit organizations were therefore founded and led mostly by the church leaders.

In the first years of Slovak settlement in the USA, various kinds of problems were discussed in so called "saloons" where beer and cheap meals were served. Slovak immigrants felt the need for social services and formal communities. Soon, the first formal institutions were established in the USA called the fraternal-benefit societies.This organizations represented a radical change in thinking and acting of Slovaks in America and they sow the seeds for interfering into political situation in their home land in Europe later on during the years of the formation of the first Czecho-Slovak Republic.

First organizations were established on the religious basis. Roman Catholic, Greek Catholic, Lutherans and etc set up their own institutions sometimes within the same community. Commonly, they helped to establish the community churches [2]. The national and social programs represented a high priority for Slovak-American fraternal organizations with the intention to build national awareness in Slovak immigrants. Soon, more than 40 fraternal organizations had been formed in northeastern and midwestern United States. One of their primary goals was the unification of all organizations on a nationwide basis. In addition, they provided supplementary lessons especially for children of Slovak origin in Saturday or afternoon schools and provided the immigrants and their families with disability insurance and death benefits. For instance, when a worker was injured, the association compensated their family. They helped the immigrants to adjust to American way of living. Many priests had left Austrian-Hungarian Empire and settled the parishes in the USA. Peter V. Rovnianek was the first leader of this movement. First organizations were built near Slovak immigrant settlements but as a result of the migration their offices moved to other parts of the country. The foundation of the fraternal associations represented the significant shift of Slovak life from humiliation to democracy and liberty [3].

The First Catholic Slovak Union of the USA and Canada was founded in February 1890 by Rev. Stephen Furdek followed by The First Catholic Slovak Ladies Association of the USA and Canada in 1892 and The Slovak Catholic Sokol in 1905. The National Slovak Society was formed in Pittsburgh by Peter V. Rovnianek, the man who launched the first Slovak daily newspaper in Pittsburgh and who dreamt of uniting all Slovaks under one association. But Stefan Furdek, a reverend of Cleveland, established a rival organization called the First Catholic Slovak Union of the United States and later of Canada on September 4, 1890.

Peter Rovnianek was a significant personality in Slovak American movement and he helped to scatter small local lodges into organizations acting on a national basis. He dreamt of a national fraternal organization and fought against the oppression of Slovaks in Hungary. He was one of the greatest leaders of Slovak American community. He studied in Budapest and became a prominent journalist and a founder of the National Slovak Society on February 25, 1890. However soon he had to face the opposition of Stefan Furdek who showed his disagreement of the nondenominational national fraternal. Furdek supported the guidance of Roman Catholic priests in Slovak National Society.

The national Slovak Society, the Slovak League of America, was founded in 1907 to help to prepare Slovak immigrants for American citizenship and to promote the welfare of Slovaks in the USA. Their members organized donations for funerals or provided the support for the political movements back home [3]. The formation of the Slovak League of America meant a breakthrough in the life of Slovak immigrants as well as back home in Europe. Slovak League of America in combined effort with other ethnic organizations helped the immigrants to become US citizens and to promote their Slovak national heritage in order not to be considered as Austrians or Hungarians. T.G. Masaryk asked The Slovak League of America together with the Bohemian National Alliance, the Czech organization in the USA, to support the activities towards the formation of the first common state of Czechs and Slovaks. In 1914 T.G. Masaryk started the movement of liberalization of the Czechs and Slovaks from Austrian and Hungarian rule. T.G. Masaryk considered Slovaks and Czechs to be one nation and supported the idea of the common independent state. But the Slovak League was not sure about the idea of a new common state due to the fact the Czechs outnumbered the Slovaks in Europe and did not want Slovaks to be dominated by the Czechs. Eventually, the representatives insisted on the common state on the federation basis. The Cleveland Agreement was signed on 22 October, 1915 followed by the Pittsburgh Agreement on May 31, 1918 declaring an independent administration, courts, legislative, parliament, the use of their language for Slovakia within the common state named Czecho-Slovakia. It was the sign that Slovak Americans were able to support and control not just their own activities in the USA but more importantly back home in Europe that helped to form the Slovak patriotism and national identity [4]. The new state, Czecho-Slovakia, was established on October 28, 1918 with the full competence of Slovakia to rule their part of the country.

The Slovaks received their own rights for ruling in 1938 at the time when Hitler rose his power.Czech authorities were aware of Hitler's ambitions to misuse the tension between Czechs and Slovaks to dismember Czechoslovakia and gave Slovakia the competence for self-ruling again. Hitler continued in his actions to dismember the common state and supported the idea of the Slovak declaration of independence. Soon, on March 14, 1939 the independence of Slovakia was proclaimed and the First Slovak Republic was created. The Slovak declaration of independence surprised Slovak immigrants but eventually they supported the new state. The Slovak League of America supported the new state until the United States was drawn into the war in 1941. Slovak Americans believed in the right of Slovaks to self-determination during the World War II. The Slovak League of America sent a delegation to the World Security Conference in San Francisco in 1945 to support the idea of the independent Slovakia. The discontent with the post war situation resulted in the next waves of immigration into the USA and Canada. The immigrants were mostly the supporters of the independent Slovak Republic [4].

Another wave of immigration of mostly official and intellectuals, the supporters or either Czechoslovakia or independent Slovakia, happened after the Communists seized the government. They both formed their own organizations and published their own newspaper. The Masaryk Club of Boston was named after the first president of Czechoslovakia Tomas Garrique Masaryk and supported the restoration of freedom in Czechoslovakia. The roots of the club date back to 1905, during the time when most of the Slovak and Czech immigrants arrived in South Boston. Many refugees from communist totalitarian system fled to America. The members of the club supported the American Fund for Czechoslovak refugees and continued with their social and cultural activities. In 1968 many intellectual dissidents had to leave Europe and came to the USA and Canada to seek liberty and a better life. They usually did not join already existed organizations. Another wave of immigration, about 3,000 people, appeared in 1970 and 1990.

3. The first Slovak Press Activities in America

It was the press that ensured the unified Slovak movement abroad. Apart from the lack of finances, many newspaper and magazine printing houses appeared very soon. Many of them were of no cultural or social value and stopped their activities very early. But overall, the newspaper or magazine represented the highest national institution for cultural and political life of Slovak immigrants and they fulfilled the information, scientific, educational, cultural and political functions that were lacking in Slovakia that time. It concentrated not just on the life in America but also in Europe. It was much easier for the first independent journalists or fraternal societies to write in a democratic environment than under the strict Hungarian pressure back home. Konstantin Culen in his study "Slovaks in America" divided the Slovak press in America into three major groups:

The first group was represented by Slovak press written to support Slovak nationalism, the second one the press written in Slovak language but not supporting Slovak national and cultural life and the third one was Hungarian and anti- Slovak oriented [5]. Many Slovak magazines and newspaper tried to meet the immigrant's needs for information. One of the first Slovak publishers was Peter Rovnianek and Stefan Furdek. They were rivals but both used their editorial skills to support Slovak nationalism among their readers because they belonged to the opposite religions divisions within the Slovak community in the USA. They attacked the Hungarian government in their articles [5].

The First Slovak press was formed under the social pressure and desire for relevant information. Its establishment was difficult because just few Slovak Americans were capable of reading and writing and due to the Slovak negative attitude to press in general. As K. Culen wrote in his study Slovak immigrants believed that the press belongs just to the hands of higher class. The first Slovak Bulletin was released in in 1885 by Jan Slovensky. Bulletin was not actually a real serious magazine but just the regular correspondence issued in the form of frateral letters informing Slovak Americans about the everyday news. The bulletin was prescribed just by the owners of so called sallons and there it was read by almost the whole village [5].

First real printed Slovak newspaper issued in America was called Amerikansyko Szlovenszke Novini in Pitsburgh in 1886. One of the first authors of the newspapers' articles were Jan Slovensky and Jan Wolf. Another significant newspaper issued in America appeared in 1888 with the financial support of the Roman Catholic priest rev. Gelhoff. The magazine was called Nova vlast. Unfortunately, the magazine finished the same year it was established. Peter Rovnianek launched the first Slovak American newspaper written in official Slovak language. In 1891 Americansko slovenske noviny was founded and the newspaper became one of the most widespread newspapers in the region. Many authors living in Slovakia contributed with their articles into the newspaper critizing the Hungarian press issued in America as well as back home in Europe. Slovak in America is one of the oldiest Slovak newspapers issued in America. It was launched in 1889 in Plymounth as a weekly magazine [3]. The first Slovak English dictionary was published by Jan Slovensky and it was called Americky tlumac and was written in eastern dialect. It became very popular because it fullfilled all the needs of Slovak immigrants in America. In 1901 Peter V. Rovnianek launched Slovensky dennik as the first Slovak daily newspaper in America.

The peak of Slovak press was in 1936. During this time fifty-one newspapers appeared in Slovak language. Nowadays just one Slovak newspaper, the monthly Slovak in America is still published in Slovak language [5]. Besides the newspapers and periodicals, the immigrants enjoyed reading almanacs. The first one was published in 1890 and it was called Americky Slovak, the other one was named First National Almanach (Narodny Kalendar) which provided the index of 40 books published in America. Thanks to Slovak press in America, the social and political situation in Europe was well known throughout the world.

4. Conclusion

The fraternal organizations helped to form the national, cultural and religious identity of the Slovak immigrants. It helped to awaken the Slovak interest in national issues and encouraged the nation to speak up for their rights abroad as well as back in their home land. This paper stresses the significant change in development of Slovak national thinking within political, historical and cultural context with the help of the first political and cultural organizations and the first Slovak-American press release. Nowadays the descendants of Slovak origin are pround of their ancestor artistic, literary, technological, scientific and political activities and achievements. Many of them keep in touch with a contemporary situation in Slovakia by regular correspondence and visits to Slovakia as well as by subsribing the Slovak periodicals. Even nowadays the history of Slovak political activities in the USA continue to help to define the Slovak ethnicity in America and also in Europe.

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Martin Katuscak *

USE OF DIGITAL CULTURAL AND SCIENTIFIC CONTENT IN EDUCATION – A RESEARCH PROJECT UNDER THE "MEMORY OF SLOVAKIA" CENTRE OF EXCELLENCE

Abstract: The paper deals with a sub-project of the Memory of Slovakia research and development project focused on cultural heritage related to Slovakia and preserved in Slovak memory and heritage institutions, and its preservation and use by numerous types of users, especially in new contexts of digital media based education in primary and secondary schools of the Slovak Republic.

Key words: *Digitisation, Cultural Heritage, Education.*

1. Introduction

Rapid development of information and communication technology over the past decades made it possible to communicate quickly and efficiently, which also applies to learning. Classrooms are gradually taken over by digital media. In the meantime, traditional memory and heritage institutions have to face the digital future too. Users of the present day are getting used to instant access to content, which creates pressure on institutions to expose all their holdings in the digital form if they wish to survive. While users will be certainly happy to have access to digital content, one needs to find an answer to the questions how digitised cultural and scientific content may be used and for what purposes.

2. Digitisation and Europe

Digitisation of cultural, educational and scientific content is of paramount importance in the development of a society where information and knowledge are the major factors of production. Many countries all over the world recognise the significance of digitisation and include this issue in their political agendas. In case of the EU, it is the Digital Agenda ([1], 2010) which calls for increasing citizen's media and digital literacy with growing use of information and communication technologies. It is important for the development of information society and knowledge economy. The Agenda reaffirms on the European level the key role of information and communication technologies (ICT) and the internet and sets ambitious targets for digitization in general. The Agenda aims to maximise the social and economic potential of ICT and particularly the Internet as a live medium and means of economic and social activities in the field of business, work, entertainment, communication and self-realisation of people. The implementation of this agenda is expected to be an incentive for innovation, economic growth, the development of quality of life and business. Specific benefits include for example better healthcare, better transportation, cleaner environment, new opportunities for media and easier access to public services and a new, universal access to cultural content. In Europe's cultural domain, member countries share a common vision of creating a unified multilingual portal Europeana.eu. The project of Europeana is co-financed by the European Commission and it is guaranteed by the Dutch Royal Library in The Hague and the European Digital Library Foundation. In 2010 the European Commission announced a requirement of 10 million objects in Europeana. The technological and organisational avantgarde developed for over a decade in a group of cooperation projects is the European Library (TEL – TheEuropeanLibrary.org), which is currently a well-maintained and functional service that provides uniform access to catalogues and collections of national libraries of Europe with value-added services. There are numerous EU-funded research or content-oriented projects in relation to digitisation, and a number of initiatives focused on legal issues associated with access and preservation of digital content.

3. Digitisation and Slovakia

There are 5 major digitisation projects to be implemented, which will be completed until 2015 under the Information Society Operational Programme (2007–2013) using EU Structural Funds. Besides the Digital Library and Archives, it is the Digital Gallery, the Digital Museum, Digital Monuments and Digital Audiovisual Heritage and associated infrastructures-oriented and on-demand project with a total budget of 217 million EUR ([2], 2011).

On the one hand, the Slovak Republic is in an advantageous position because of the fact that huge resources from the EU Struc-

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tural Funds are planned for the period 2007–2013 for digitisation under the Information Society programme, aimed also at creating the necessary technological infrastructure and produce critical mass of content. By 2013, the program will have created about 3.5 million digital objects, of which 2.8 million objects represent written (textual, documentary and archival) heritage. On the other hand, unfortunately, steps taken, or not taken, by Slovak executives have caused a severe delay, resulting in a situation that actually after one half of the programming period not one digitisation project has been started yet. Nevertheless, in the recent years, the Slovak National Library, a top-level national cultural heritage institution made progress in building a part of the infrastructure needed to implement the ambitious national project of digitisation practically complete Slovak and Slovakia-related written and printed heritage, consisting of books, newspapers, journals, manuscripts, maps, music, photos, postcards and other materials under a common strategy in coordination with other relevant state and self-government entities. The infrastructure includes digitising lines with an automated page-turning robots, mobile modular data centre, robotic tape library, disk arrays, servers and network technologies. These are the building blocks needed to create digital libraries for preserving and accessing content. The long-term vision is to establish an Integrated Competence Centre for conservation, preservation, digitisation and microfilming.

The mission of the "factory" that must be built with the participation of all stakeholders, is the production and long-term maintenance of digital content including creation, capturing, long-term preservation and retrieval, not only in the public domain, and providing these for re-use through portals and services for different purposes such as education, science, research and development, tourism etc. In short, users – from the learners to curious seniors, need quality content offered via quality services.

4. The Memory of Slovakia R&D Project

The Memory of Slovakia project – the National Centre of Excellence in Research, Preservation and Accessibility of Cultural and Scientific Heritage, project no. ITMS 26220120061, 2010–2013, University of Zilina, Faculty of Humanities, Slovak National Library in Martin. The strategic goal is to establish the National Centre of Excellence in Research, Preservation and Accessibility of Cultural and Scientific Heritage with internationally recognised basic research. The project's budget is almost 4 million EUR ([3], 2010).

The project will contribute to improving the technical infrastructure of leading research institutes in the field of protection and access to cultural and scientific heritage in the Zilina Region, as the current level of technical infrastructure does not allow to implement a number of research activities at the appropriate level of quality, or does not allow to implement these activities at all. The project implementation will improve significantly the conditions of educational process and training new generations of researchers. In theory and practice, the project addresses research areas such as research on the history of book culture, research on the preservation and conservation techniques, and research on usability of digital cultural and scientific content in education. One of the sub-projects of the Memory of Slovakia concentrates on the use of digital cultural and scientific content in primary- and secondary-level education. It will be well-furnished with various digitised contents which can be selected, processed and used in the educational processes. Under the Information Society Operational Programme, there are thousand of other media types to be prepared for use, from libraries, archives, galleries, museums and audiovisual organisations.

The particular sub-project specialises in a concept of a school digital library with the following objectives and activities:
- research and development of usability and accessibility of digital cultural and scientific content, especially in the field of education,
- designing solutions for the use of cultural and scientific (especially digital) heritage in education,
- research on user needs focused on specific group of learners and the identification of needs for development of tools of information retrieval, knowledge capture and learning,
- design, specification and development of a model for using cultural, scientific and intellectual heritage for educational purposes to be implemented at national level using the latest technologies,
- research, analysis, specification, determination of methodology for development and verification of a replicable model for the use of cultural, scientific and intellectual heritage for educational purposes for communication with potential stakeholders and their involvement in the project (i.e., content holders in the organizations of cultural and scientific heritage, state institutions in the field of culture, education, faculties of education, elementary and secondary schools, pupils, students, school librarians, teachers etc.),
- design of digital library-based education as a subset of the Slovak Digital Library, in the context of the European and global digital libraries and integration of schools, libraries, cultural, educational and other entities in Slovakia,
- developing the Centre of Excellence for digitisation of cultural heritage (the Slovak Digital Library), and further research on user needs, setting parameters of production, processing and publishing of digital content (metadata for the use of digital content in schools, search tools, controlled vocabularies, thesauri, classification, multilingual presentation and accessibility of digital content, legal aspects of access to digital content, the technological aspects of digital content, Web 2.0 technologies like blogs, Wikipedia, user-edited content on the web, tagging content, social tags, etc.) – in coordination with relevant initiatives and programs EU focused on research and development.

The relevant technologies examined, with those covered under the EU's DIGICULT project ([4], 2004), include:
- systems for managing digital content – and long-term storage,
- mass digitisation of cultural and scientific heritage and their process (metadata, authenticity, access control),
- XML Technology Group, Topic Maps,
- Semantic Web – ontologies, taxonomies,
- systems for customer relationship management/users,

- smart labels and tags, radio-frequency identification systems,
- virtual reality technology and imaging,
- human interface, controls, keyboard, pointing devices, touch screens,
- game technologies,
- application service model,
- cultural agents and avatars,
- electronic programming guides and personalisation,
- mobile access to sources of information about culture,
- technologies for rights management and payments,
- mechanisms and technology for cooperation,
- visualization and 3D objects, virtual reality,
- navigation and context-sensitive applications,
- open source software and standards,
- natural language processing,
- information retrieval (searching),
- knowledge mining,
- positioning and navigation systems,
- data visualization,
- telepresence,
- haptics, robotics.

In particular, digitised content from the memory and heritage institutions is potentially usable in subjects like languages and literature, history, arts, not to mention vast possibilities of complementing classes of sciences with disparate learning materials.

The actual research under the Memory of Slovakia project will be carried out by external staff implementing activities upon prior arrangements with the partners involved. Researchers will examine the feedback of teachers and build a "digital classroom" where pupils or students can use various hardware and software technologies, interfaces for interaction in the learning process. Further milestones and expected results include raising awareness and education among the essential stakeholders concerning the possibilities offered by digital technologies used to access and re-use cultural heritage and knowledge. In general, the initiative is aimed at preparing pupils in primary schools and students in secondary schools for consolidation and utilisation of information and knowledge for analytical and critical thinking, independent or group research, collaboration and other skills useful for university studies, scientific research and development activities and further lifelong learning.

The project's results and recommendations will be practically implemented in the production of the Slovak Digital Library, the experience and knowledge generated will be used in the learning process (library, teaching, and other relevant departments in universities)

The deliverables under the digital library project include a usable and verified application service extension of the Slovak Digital Library, with a positive impact on advancements in processing and providing access to digital content. The project benefits are also represented in new knowledge to be exploited in education and further research and development in the field of digital cultural and scientific content.

5. Conclusion

The user-centred design of the School Digital Library as one of the outcomes of the Memory of Slovakia research and development project will be a complement to the ongoing initiatives in digital education. There are enormous volumes of knowledge left by our predecessors which can be examined, analysed and reused when necessary in many use scenarios, and education is one of the most important ones. The task for researchers in the Memory of Slovakia is to explore the ways of utilising the unique digital cultural and scientific heritage and justify the resources spent on its production and maintenance.

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ON DIGITAL READING

This paper examines possible relations between traditional reading and digital reading. A hypothesis that "digital reading" is more of a metaphor than reading in the traditional sense is advocated through pointing out the differences in organization of information space, linear/nonlinear text structure and required literacy. Also, new readability formula is proposed.

Key words: *"reading", etymology, Guttenberg area, digital reading, digital readability.*

1. Introduction

"Reading" is the subject of research in many areas nowadays, most notably in information science, psychology and sociology. While information science approaches reading from the point of view of communicating information, psychology examines reading as "a complex, multi-component and multi-level dynamic psychological process"[1)], and sociology sees reading as "a non-individual cognitive activity but a productive collective activity"[2)]. Moreover, a new category of reading – digital reading – emerged due to advances in ICT. Digital reading seen through the optics of information science is a completely new phenomenon[3)]. It adds new dimensions to the concept of reading. These new dimensions lead to the hypothesis that "digital reading" is more of a metaphor than reading in its traditional sense. In this article we look for evidence of such view. The article is organized as follows: in the first chapter, etymology of the word "reading" is discussed; the second chapter briefly discusses the concept of reading since Guttenberg's invention of the printing press. The specifics of digital reading are pointed out in the third chapter; a new readability formula is proposed in the fourth chapter and, finally, conclusions are formulated.

2. The etymology of the word "reading"

To our knowledge, the etymology of the word "reading" in Slovak language has not been published yet. It seems that, similarly to other Slavic languages, the verb "citat" refers to "counting something". As for non-Slavic languages, elsewhere in literature we can learn that "reading" has its origin in ancient Greek word "*legein*", which means "to say" or "to declare"; in Old Latin the equivalent of "reading" is "*lignum*" meaning "that which is gathered"[4)]. The etymology of the word "reading" in most Roman languages also goes back to Latin – "*leggere*" in Italian, "*lire*" in French or "*leer*" in Spanish. It can be observed that while the Greek word "*legein*" points out to an act of speech, or in other words, that reading is another way of processing speech, a significant shift in the meaning can be found in Latin – "to gather" is close to Slovak notion of "counting something". The etymology of "reading" is also briefly discussed by Senn[5)]. He concludes that "*In English the verb is related to acts of guessing, advising or riddles; Latin and German take their metaphor from collecting ("legere", "lesen"). The Greek word anagignoskein (related to "know") takes it originally as a process of recognition, an ongoing one as its ending in -skein informs us ... we put items together, we guess, and we may chancily recognize something we already know*".

3. The concept of reading in Guttenberg era

Gutenberg's invention of printing press gave birth not only to books but also to a new type of literacy where the ability to read plays a key role. Since then the process of reading has been analysed numerous times. Theories on reading can by classified into three categories[6)]:

- The traditional view: Readers passively receive information from the text through decoding printed symbols into their aural equivalents and consequent allocation of meaning.

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1) ZAPOTOCNA, O., GAVORA, P. (Eds.): The Central European Conference on Reading. Abstract of Papers. 2000. SRA-SLJS, ISBN: 80-968403-0-4, p. 82

2) HRUBY, G. G.: Sociological, postmodern, and new realism perspectives in social constructionism: Implications for literacy research. 2001.

3) Digital reading is also subject of research in pedagogy. We will not deal with its result in this paper.

4) Online Etymology Dictionary. <http://www.etymonline.com/index.php?term=lecture>.

5) SENN, F. Joycean Murmoirs: Fritz Senn on James Joyce. 2007, ISBN-13: 978-1843511250

6) VAEZI, S. Theories of fading.

- The cognitive view: Active readers sample the text and in an iterative manner make hypotheses on meaning that they later confirm or reject.
- Metacognitive view: According to Klein et al. (1991)[7], active readers sequentially pass through several stages: identification of a need to read, identification of a form/type of the text to be read, identification of general text feature, guessing the author's message hidden in the text, predicting what will come next. The reading process can be thus described by the following equation:
  understanding = prior knowledge + forecast of meaning

The objective of reading is not an act of reading itself but an act of understanding and subsequent exploitation of information received either on practical or aesthetical levels. However, from the point of view of understanding, reading is a hierarchical process with four stages of reading:
1. Elementary reading,
2. Explorative reading,
3. Analytical reading,
4. Synoptic reading.

4. Specifics of digital text

Let us now take a look at the specifics of digital texts:
- space limitation (while a book is always limited to a finite number of pages, digital text is theoretically unlimited),
- different type of physical carrier (paper versus electronic signal),
- wider scale of modes of information (alphanumerical text, audio, picture, video, multimedia),
- text computability (ability to process the text by computer),
- shape of information spaces and possibility of transfers among them.

5. Specifics of reading of digital text

Process of reading of digital text is influenced by hypertextual character of digital texts, cultural context (from local to global) and feature of interactivity. Among the above mentioned differences, the following three are considered key differences:
1. nonlinear structure of digital text,
2. size of accessible texts,
3. possibility to change not only the form of the text but also the text itself (i.e. computability of text.

All these three differences result in completely different nature of digital reading. Digital reading has not such depth as traditional one. The term "surfing" is good approximation of the digital reading process.

6. New readability formula

The term "readability" is used in connection with texts printed on paper; it denotes the ease with which a text can be read and, most importantly, understood. On the other hand, "readability" used in connection with displaying text on a screen is aimed at improving the screen design by choosing proper fonts, font sizes, colours, arrangement of texts and pictures or various technological effects. In other words, "readability" objectives target the most basic level of reading process, namely the improvement of sensation of isolated text symbols. We will extend the meaning of "readability" further into the area of comprehension of digital information spaces, and, therefore, denote this kind of extended readability as "digital readability".

6.1 Readability of printed text

Numerous readability tests can be found in literature. In English speaking countries three following methods are especially popular:
- Readability Formula designed by E. Fry[8],
- Grade Level Readability Formula by R. Flesch[9],
- Fog Index constructed by R. Gunning[10].

Sentence length and word length are key indicators of text complexity. However, not all long words are equally difficult to read. Hence, familiarity with words and vocabulary richness are used as supporting readability indicators. Too many unfamiliar words can block the cognitive process. This is the reason why some formulas, e.g. Dale – Chail formula[11], use different lists of "hard" words. Similarly, vocabulary too rich (i.e. too many different terms in a text) make understanding the text read difficult.

Fry's algorithm for design of readability diagram consists of the following steps:
1. Random selection of three unrelated 100-word texts.
2. Counting the number of sentences in each text.
3. Counting the number of syllables in each text.
4. Plotting the average sentence length and the average number of syllables
   (y – average number of sentences, x – average number of syllabus per 100 words).

The area covered by the graph designates "complexity" of a given text.

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The Flesch Grade Level Readability algorithm is described by the following formula:

FGL index = 206.835 − (1.015 * average number of words used per sentence) − (84.6 * average number of syllables per word)

FGL index spans from 0 to 100. The higher the index, the better the readability of the text. *FGL index* between 60 and 70 indicates readable and, at the same time, not too trivial texts.

The Gunning Fog Index is calculated using the following formula:

$$GFI = 0.4(ANW + PLW)$$

Where *ANW* is the average number of words per sentence, *PLW* is the percentage of long words out of the total number of words in the text. The higher the *GFI*, the less readable the text. *GFI* above 20 is typical for scientific texts, law or government documents. In general, *GFI* is a good indicator of a text that is difficult to read.

The Dale-Chall Readability Index is defined by the following formula:

$$DC\ index = 0.1579\ DW + 0.0496\ SL = 3.6365$$

Where *DW* denotes the percentage of so-called difficult words (special list of words), *SL* denotes the Average Sentence Length (expressed by the number of words).

DC index on scale from 0 to 9 represents texts easily comprehensible even to people with only primary education. Index higher than 10 indicates that a college degree is required in order to fully understand the text.

6.2 Digital readability

The term "digital readability" will be used in order to stress the fact that we live in a digital environment. Digital readability consists of two parts:

- Traditional readability determined by identical parameters as readability of text printed on paper.
- Readability of digital information space that results in additional difficulties in text comprehension due to nonlinearity of digital information spaces. In order to overcome this obstacle, a new kind of literacy is necessary.

Among the formulas of text readability described above, The Gunning Fog Index seems to be the most suitable basis of digital readability standard design. We propose the following modification to Gunning formula:

$$DGFI = q_{DL} \cdot q_{DR}[0{,}4(ANW + PLW)]$$

Where *DGFI* is digital Gunning Fog Index, q_{DL} is the digital literacy quotient* < 1, q_{DR} id digital readability index < 1, *ANW* is average number of words per sentence and *PLW* is the percentage of long words out of the total number of words in the digital text.

7. Conclusions

According to available predictions of future developments, digital publications will exceed those in print in year 20xx, where years xx vary in literature between 2015 to 2030. Another fact that has to be taken into account is the growing number of hours people spend in front of their computer screens. These two facts accelerate the urgency of research on digital reading. Results of such research should tell us how to write digital texts in order to make them more readable. Some preliminary results obtained from research carried out in a frame of KEGA project No. 3/7177/09 indicate that more attention should be paid to creation of hypertext information spaces. Heterogeneity of styles of different parts of such space, differences in vocabulary, different approaches to subject matter make such digital text less readable that traditional linear text. On the other hand, hypertext structure opens the door for presentation of different views and hierarchical organization of text. Our position is that digital reading should be subject of teaching in the same way as it is in case of traditional reading.

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* Magnitude of quotients q_{DL}, q_{DR}, is subject of research supported by KEGA project No. 3/7177/09

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ON ACCESS TO UNIVERSITY INFORMATION RESOURCES

Paradigm of access to information resources has been radically changed due to developments in ICT. While old paradigm said that "University is buildings surrounding the library" under new paradigm databases of digital information sources are the heart of University. Model of building university digital information sources and method of access to them is presented in this contribution with the stress put on legislative aspects.

Key words: *university information resources, online access, libraries, copyright.*

1. Introduction

University educational process is, more and more, organized around digital information sources having usually form of digital library. However, digital library itself is only partial solution of the problem. New trends are heavily discussed in literature – see for example Dobre[1)], Agnew[2)], Teich[3)]. While technological solutions are available in a readymade form, organizational and, especially, legal aspects have to be designed case by case. Model of building university digital information sources and method of access to them is presented in this contribution with the stress on organizational and legislative aspects, respectively. The paper is organized in the following way: relevant trends are outlined in the first paragraph; second paragraph is devoted to the analysis of Slovak copyright act from the point of view of digital information resources, model of solution is presented in the third paragraph and key points of the design of system of access to study literature are summarized in conclusions.

2. Trends in organization of university educational process

The following trends are clearly visible today:

1. Shift from traditional lecturing to discussion groups
   While under old educational paradigm a lecture was the key component of university educational process and, at the same time, the main source of information, new paradigm put stress on student's individual work with digital information resources.
2. Shift from making notes through copying and highlighting to making electronic notes
   Times when students made handwritten notes are over and copying text from books and subsequent highlighting of important sentences is on the decline. Trend is towards editing/commenting digital texts.
3. Shift from information deficiency to information overload
   Lack of information resources due to limited number of available copies of book in the library, limited offer from catalogue is replaced by a flood in information of various quality. The more and more is perceived a lack of traditional library services, e.g. classification of resources.
4. Shift from linear structure of information resources to nonlinear (hypertext) structure
   A book represents an information space that is limited by size, time invariable, linearly organized and meets the conceptual characteristics of "work" according to Slovak copyright act[4)]. Digital information resources are, as a rule, of a nonlinear nature. This feature allows for theoretically unlimited expansion of information spaces. Moreover, such a space consists of "works" of many authors, not excluding foreign ones. Another feature of such digital space is its granularity, i.e. possibility to break it down into autonomous digital objects. Yet another relevant features are temporality and editability.
5. Shift from time invariant sources to frequently upgraded sources
   When book is published there is no way to upgrade it in another way than through new edition. Digital information resources, on the contrary, can be upgraded even on a daily basis. Again, from the point of view of law, each upgrade can be taken for a new "work".

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3. Slovak Act on copyright

Slovak Act on copyright and rights related to copyright (the Copyright Act – CA) is the principal source of copyright and neighboring rights. The philosophy of the CA comes out from Berne convention[5]. It does not require any formality to be fulfilled for obtaining a copyright protection of a work and no sign or notice need to be placed on a work in order to be copyright protected. Copyright subsists upon a work immediately when it is in a form perceivable by human senses. The CA is built around three key terms: the author, the work, the rights. No explicit definition of "the author" can be found in the CA. However, it is stated that the author shall be physical person who creates particular work with given attributes (e.g. creative processing of idea). A work is described as unique product of an author's own creative intellectual labor in a form perceivable by human senses. Moreover, by its nature, it has to be literary, scientific or artistic work. As for rights, they are of two kinds – moral and economic ones. There are two types of moral rights: the right of authorship (the right to sign a work with author's name, to use pseudonym or not to use any name) and the right of integrity of a work. Economic rights give the author an exclusive right to authorize any type of use of his/her work. "Any type" means literally all activities that can be performed upon a work – to copy it, to transmit/broadcast/display/make available to public, to translate, to adapt, etc. While protection of the moral rights is not limited in time economic rights are granted to the author during his/her life plus seventy years after his/her death.

So called "library licence"[6] allows libraries to lend traditional books and make copies under strictly defined conditions. Lending of books in a digital form is even more regulated – restrictions are placed especially on copying and online access. Restrictions on online access in fact do not allow libraries to offer their digitised information contents outside their premises.

Most of information resources used in educational process at universities (e.g. monographs, articles, etc.) have character of author work in a sense of the CA. Any type of use of these resources (including their digitization) can be done only on a basis of author's permission.

4. Model of solution access to university information resources

Design of model of access to university information resources is complex problem. It has its technological, managerial and legal aspects. The sequence of tasks to be solved is depicted in Fig. 1.

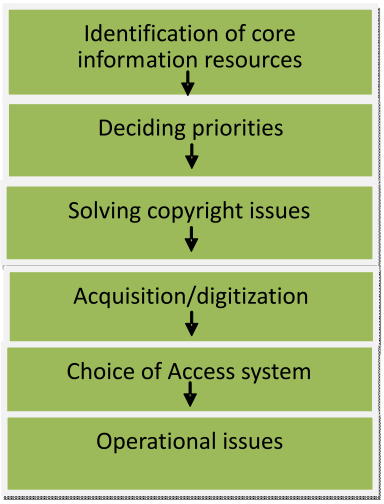

Fig. 1 Workflow of process of design of system of access to university information resources
From among all these activities we will focus our attention only on steps three "Solving copyright issues" and five "Choice of Access system"

4.1 Solving copyright issues

As we have already mentioned, most of information resources that should be included into system of university information resources are copyright protected. At the same time, however, authors of most of works come from members of university staff. This fact offers opportunity to solve copyright issues by one model agreement or only a few types of agreement. Right to make digital copies, right to migrate work on new physical carrier and right to make work online accessible have to be subject of agreement.

4.2 Access model

Two completely different models come into consideration – free access or controlled (and eventually paid) access. It would be naïve to expect the authors would agree to provide works protected by the CA under free access model. This is why we will elaborate only on controlled access model in details.

Principles of controlled (paid) access to information resources have been articulated almost simultaneously with an emergence of digital information content. These principles are materialized in so called Digital Rights Management systems (DRM)[7]. DRM is

[5] Berne Convention for the Protection of Literary and Artistic Works.1886.
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* Controlled acces is recommended in this case.
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usually perceived as a complex system of protection of copyright related to digital information contents. However, DRM is by no means only another passive system of data protection. It provides also for digital management of rights through trading rights to particular digital content, license monitoring, rights owner monitoring, etc. Thus, DRM acts upon the triangle depicted in Fig. 2

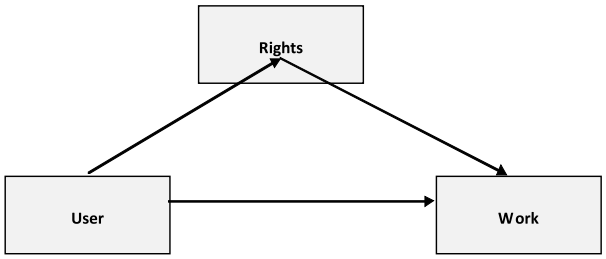

Fig. 2 Key entities in DRM

Though there is a strong opposition against implementation of DRM, the idea itself is backed by international organizations, e.g. WIPO[8], governments and European Union[9]. We recommend to apply principles of DRM in a system of university information resources. Such approach would allow for effective management of digital contents, rights related to these contents, monitor an access to them and their use. There are three fundamental types of rights that have to be managed in a system of DRM[10]:

1. Render rights (to print, to view, to execute – e.g. to play,
2. Transport rights (to copy, to loan, to move),
3. Derivative work rights (to edit, to extract, to embed).

Each user is given specific set of rights in a form of digital license. A license is extremely efficient tool for enforcing copyright. If particular right is not explicitly listed in a license then the system does not allow user to exploit it. Another advantage of licensing is possibility to grant rights on a basis of time (e.g. right of view for a month) or number of uses (e.g. five accesses to particular content).

5. Conclusions

Design of system of access to university information resources covers three at least equally important tasks: to find technological solution, to design managerial and operational structures and to solve copyright issues. While there are many both proprietary and open source technological solutions, design of managerial and operational structures has always to be adapted to given conditions and requirements and should take into account already existing environment. Solution of legal aspects is of different nature. Here is just a little room for "local solutions". Two documents have to be prepared – agreement and license. The license should be articulated in such a way that allows its subsequent transcription into algorithm implementable in DRM system.

Only key principles of system of access to university information resources were outlined in this article. Detailed design of system requires coordinated effort of the university top management, university library, faculties and departments.

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Svetla Fiserova – Martin Hrinko *

STUDY OF ACOUSTIC PARAMETERS OF AUDIBLE AND VISUAL WARNING DEVICES USED BY THE POLICE OF THE CZECH REPUBLIC

In the article, the authors are concerned with acoustic parameters of audible and visual warning devices used by the Police of the Czech Republic. The objective of the article is, in context with the fundamental rules of sound and its propagation in environments and with associated health risks, to describe in accordance with valid legislative requirements the acoustic parameters of audible and visual warning devices used by the Police of the Czech Republic. Results of the acoustic study, their evaluation and recommendations for their field use will be presented.

Key words: *Police of the Czech Republic, acoustic quantities, noise, noise measurement, special audible and visual warning devices, sirens*

1. Introduction

Experience of road traffic shows clearly that vehicles having the right of way, have to be, as well as possible, equipped with an audible warning signalling device so that they could be distinguished in road traffic in sufficient advance. Then vehicles have to be equipped with a sufficient amount of efficient devices emitting pulses of warning light and devices generating warning sound with a variable tone pitch. Solving the problems of used audible and visual warning devices deserves individual attention. The reason is that using the audible and visual warning devices leads to a reduction in risk of traffic accident and a decrease in response time. When using the audible and visual warning devices, many kinds of acoustic signals exist, and it is of importance to other traffic participants to know how to behave [4]. That is why the authors of the article submit a comprehensive study and results of made measurements of acoustic parameters of audible and visual warning devices of the Police of the Czech Republic (henceforth referred to as PCR). The measurement as well as the evaluation of obtained results is carried out in conformity with the requirements of relevant valid legislation and international standards. In the framework of implementation of a joint project based on co-operation of Faculty of Safety Engineering of VSB – Technical University of Ostrava and the Regional Headquarters of Police of the Moravian-Silesian Region of PCR, both acoustic and photometric parameters of audible and visual warning devices of the PCR were compared and the results were the content of two Master's theses thematically focused like that; the authors being students in the field of Safety Engineering of Faculty of Safety Engineering of VSB – Technical University of Ostrava.

2. Properties of Acoustic Warning Signals

The auditory field (shape and size) is different for every individual. The shape and the size change depending on hearing defects. The greatest sensitivity of human ear ranges from 250 to 5000 Hz. The frequency of siren tones moves in the range of 540 Hz – 1500 Hz. [2] The frequency range of siren tones is set at the most sensitive range of auditory field. We can consider a change in frequency when a sound source and a detector are moving (Doppler effect). The worst case situation, leading to the greatest change in siren frequency of 1000 Hz, is the movement of the sound source Z and the detector D towards and away from each other. When moving towards each other at the velocity of 130 km/h, the frequency will be $f' = 1234$ Hz (increase by 234 Hz).[1] When moving away from each other, a frequency $f' = 810$ Hz (decrease by 190 Hz) will be recorded. The frequency range of siren tone is equal to the most sensitive range of human ear, which represents the worst level. If we want to determine the effects of noise on humans, we have to know above all the intensity and the frequency of the noise. Another essential factor is the time of noise exposure. The main adverse effect of noise is that on an auditory organ, when sound sensitive cilia in the organ of Corti die [8]. Subsequently, the mechanical transmission of waves in the middle ear is damaged. Noise affects negatively not only the auditory organ but also the quality of sleeping, compensation capacity for stress and the cardiovascular system. The adverse effects manifest themselves in hearing only at the intensity of more than 80 dB. At long-term exposure to the intensity of 85–90 dB, hearing impairment occurs. At long-term exposure to the intensity of more than 110 dB, a heavy impairment of the auditory organ up to deafness occurs. At the operation of

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sirens, individuals are exposed to the frequencies of about 1000 Hz and to the equivalent level of sound pressure of more than 105 dB and a significant adverse effect on the auditory organs of exposed persons can be expected. [5] At the assessment of noise risk to an employee of the Police of the CR, it is necessary to take into account the reasons for the use of audible and visual warning devices that are to be observed to avert the impending danger [7]. With reference to irreversible consequences that may appear after long-term exposure exceeding the hygienic limit values, it is also necessary to respect related preventive measures in the case of members of PČR.

3. Acoustic Requirements for Audible and Visual Warning Devices

In the Czech Republic, vehicles having the right of way are only vehicles equipped with a blue warning light supplemented by a special warning siren. The frequency of changes in pitch of a tone can be variable. Thus it is a case of lightbars, LED displays, supplemented by an electronic siren and a public address system. The most significant law regulating the use of audible and visual warning devices in the CR is the Act No. 361/2000 Coll. on road traffic (Road Traffic Act). In the CR, merely blue lights are allowed for all vehicles of rescue, safety and security services; combination with another colour is not allowed. Acoustic requirements are determined by legislation merely in general. A single technical parameter, which is stated in the Decree No. 341/2002 Coll., is the minimum sound pressure level determined at the value of 105 dB (A). In relation to the stated value it is necessary to apply the relevant provisions of the Regulation No. 28 of the Economic Commission for Europe (UN/ECE) – Uniform provisions concerning the approval of audible and visual warning devices and motor vehicles with regard to their acoustic signals and the Directive EEC/EC (70/388/EEC).

The maximum sound pressure level of audible and visual warning devices is not regulated by the Decree in any way but it demands keeping the sound pressure level, which must not damage the auditory organ of the individual who may be present in the vicinity of the siren. By the Regulation No. 28 of EC for Europe (EEC-ON) the maximum value of sound pressure level is determined at 118 dB (A), i.e. value smaller than the threshold of pain. This limit is in accordance with the standard CSN EN 981 (83 3593) Safety of machinery – System of auditory and visual danger and information signals.

4. PCR's Audible and Visual Warning Devices Selected for Acoustic Measurements

The basic configuration of the audible and visual warning devices and control units also includes a speaker with an amplifier. The power and the location of the speaker differ with various types of lightbars. The amplifier is located in the cabin of the car and is supplemented by control elements. In the text, attention is paid to the used audible and visual warning devices that are placed on measured police cars. In the Czech Republic, the manufacturer of audible and visual warning devices is the company Holomy Electronics.

For the evaluation of acoustic parameters, three types of lightbars mounted on three different types of vehicles were examined. The first one is a rotating warning lightbar VNK 530, which is dimensionally adapted from the point of view of maximum visibility and minimum aerodynamic resistance. The design of the lightbar enables the vehicle to drive at a speed of more than 200 km/h. The lightbar supplied for measurements can be seen in Fig. 1. On the bar blue beacons are mounted and in the central part a speaker of the power of 100 W is installed for transmitting siren tones and voice commands. The second lightbar selected for acoustic measurements is a flashing warning lightbar VSL 012LV. This lightbar has the most advanced design, LEDs of 3rd generation. The middle part of the lightbar is divided into two parts. The right one consists of a LED message board displaying red STOP. In the left part, a speaker of the power of 120 W is installed. The third lightbar is a flashing warning lightbar VSL 012FL. It is also a LED-based lightbar with a speaker of the power of 120 W, mounted usually at smaller heights; and is designed for vehicles with a manufacturer's maximum speed less than 300 km/h.

A warning device and a public address system enabling the control of executive elements of the lightbar are also part of the audible and visual warning device. Various types of audible and visual warning devices exist. These types differ from each other in the selection of elements in the set, which participate in the control of the lightbar and the speaker. Furthermore, they can differ in the number of possibilities of control and check of additional functions of lightbars, in the control of visual signals (displaying STOP, AMBULANCE, and others), the presence of a microphone socket, the presence of an amplifier in the control unit, etc. Warning lightbars were connected to various kinds of control units of type range AZD 530A. A control unit AZJ 530A makes it possible to control executive elements, light elements of the lightbar, to choose the siren tone and its loudness. During all measurements, the maximum level of produced siren tones was set on the control unit AZJ 530A [5].

The control unit made it possible to choose by switching from three preset warning siren types

Siren 1 (WAIL tone with a slow repetition frequency),
Siren 2 (YELP tone with a fast repetition frequency),
Siren 3 (Hi-LO tone with fast repetition frequencies of two tones).

5. Acoustic Measurements in Real Conditions

The issue of measurement of acoustic parameters is, with regard to the nonexistence of any specific regulation or standard, very complicated. The Regulation No. 28 of the Economic Commission for Europe (UN/ECE) and the Directive No. 70/388/EEC, prescribe requirements for the procedure of measurement of sound pressure levels of audible warning devices. These regulations *do*

Fig. 1 Lightbar VNK 530

Fig. 2 Lightbar VSL 012LV

Fig. 3 Control unit AZD 530A

Fig. 4 Lightbar VSL 012FL

not relate to special audible warning devices. In the course of measurements, calculations and also evaluations, we proceeded in accordance with relevant valid international standards for acoustic measurements and evaluation of machinery.

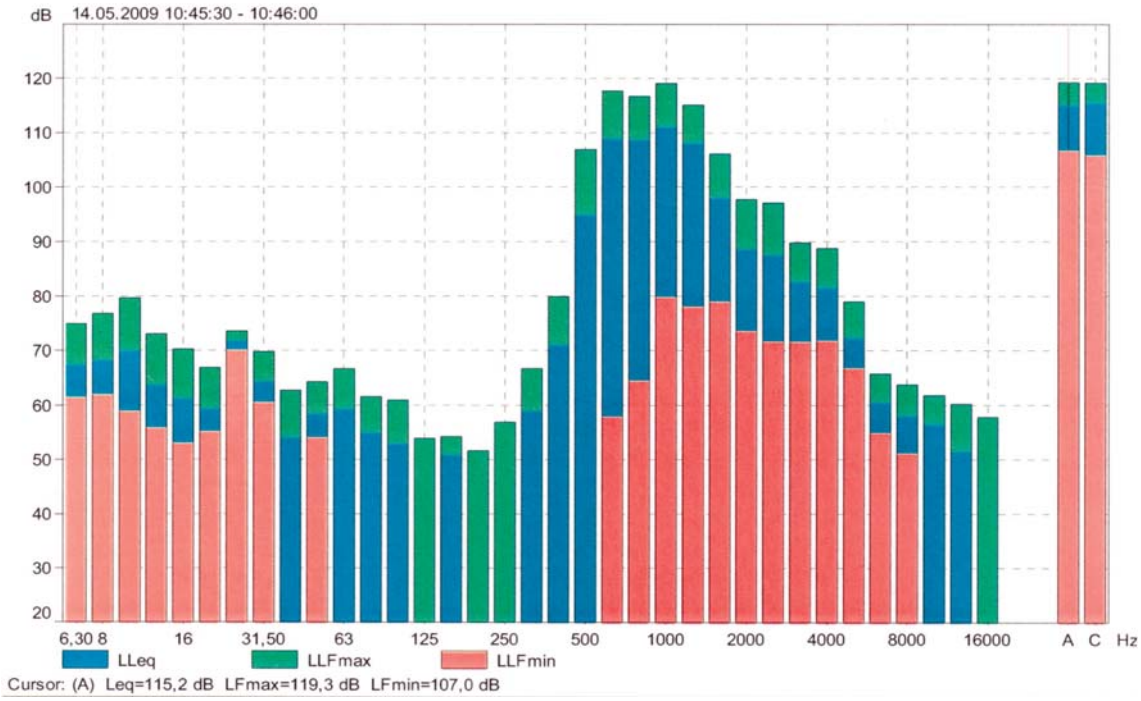
All measurements were taken in a D1 motorway segment closed to the traffic near Ostrava. In this place, three measurements were carried out. The first one served as a pilot measurement. The objective of this measurement was to find possible problems of the measurement of acoustic parameters of the audible and visual warning devices and to determine whether chosen methods can be used in real conditions. The second and third measurements were live measurements of acoustic parameters. It was the measurement of sound pressure level and power of the audible and visual warning device, its directional operation, the measurement of the frequency ranges of siren tones and of the sound pressure level in the cabin of the car in the course of operation of the audible and visual warning device.

The measurement was made using measuring devices designed for the professional measurement of acoustic quantities, namely a device B&K Observer and a device Acoustilizer A1. The processing of results was carried out electronically using relevant software products supplied with the devices, and in accordance with relevant international standards the uncertainty of measurement was evaluated as well.

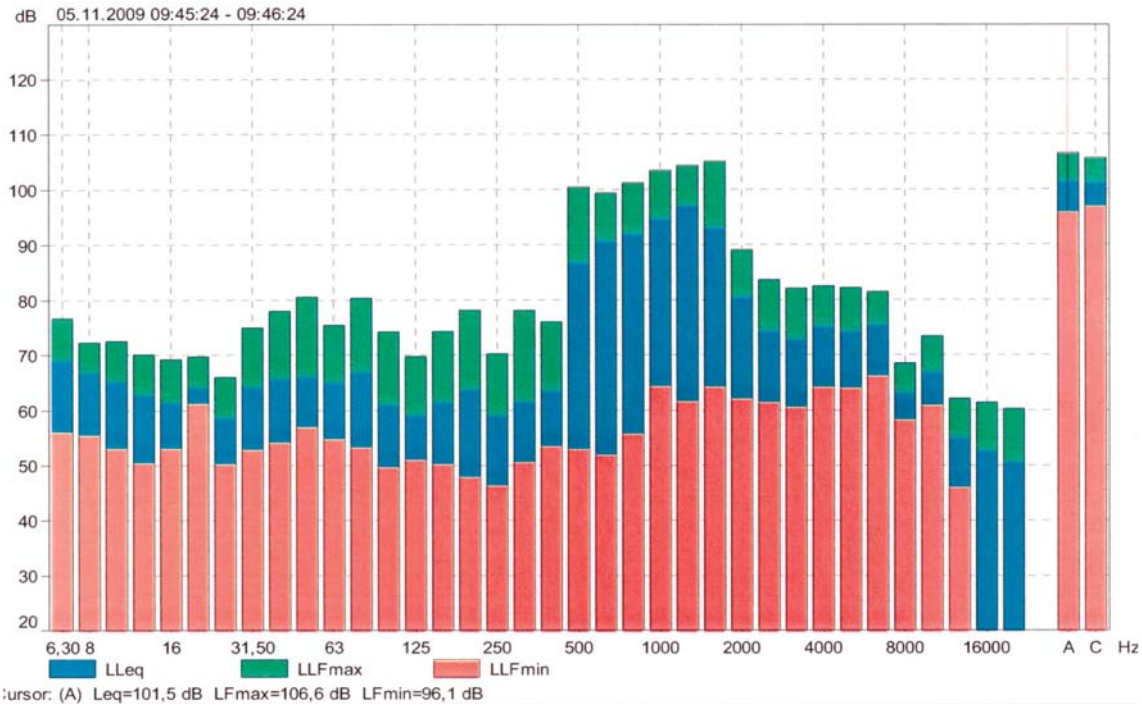
6. Results and Discussion

For the determination of acoustic parameters, three ranges of the above-mentioned types of measurements describing sufficiently the characteristics of the audible and visual warning devices were proposed. After determination of equivalent sound pressure levels of the audible and visual warning devices, the calculation of recommended duration of presence in the surroundings and in the cabin in the course of operation of the siren was executed to avoid the exceeding the determined eight-hours' hygienic limit [6]. The executed calculations should be a basis for detailed assessing compliance with the hygienic limit values at work near audible and visual warning devices.

In all three types of evaluated lightbars, comprehensive measurements with partial outputs were repeatedly done. In the following graphs, results of measurements of sound pressure of the lightbar VNK 530 – see Graph 1 and the lightbar VSL 012FL – see Graph 2 at the first of three siren types (WAIL) are plotted.

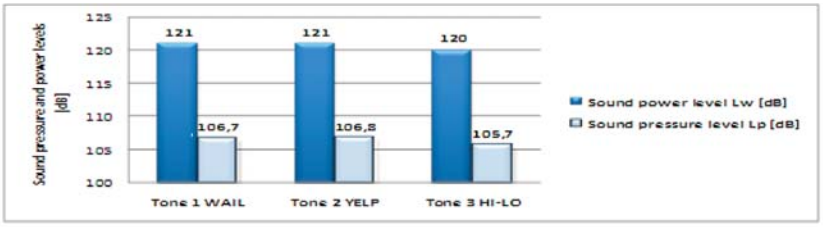


Graph 1 Level of sound pressure of VNK 530 with WAIL tone of siren 1

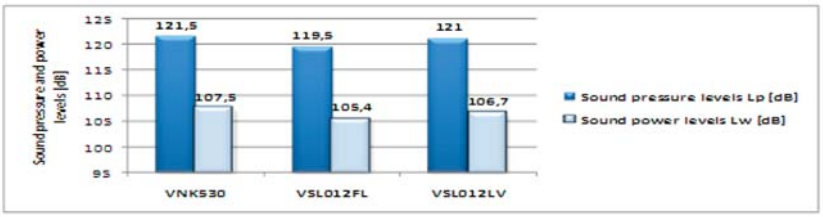


Graph 2 Level of sound pressure of VSL 012F with WAIL tone of siren 1

The following Graph 3 shows the comparison of results of acoustic measurements of all three siren types of the lightbar VSL 012LV. For the calculation of average level of surface sound pressure of the siren, a formula given in the standard CSN ISO 3744 was used. For the calculation, measured values of sound pressure levels were used.



Graph 3 Calculated levels of sound pressure and power of warning lightbar VSL 012LV



Graph 4 Calculated values of levels of sound pressure and power of warning lightbars

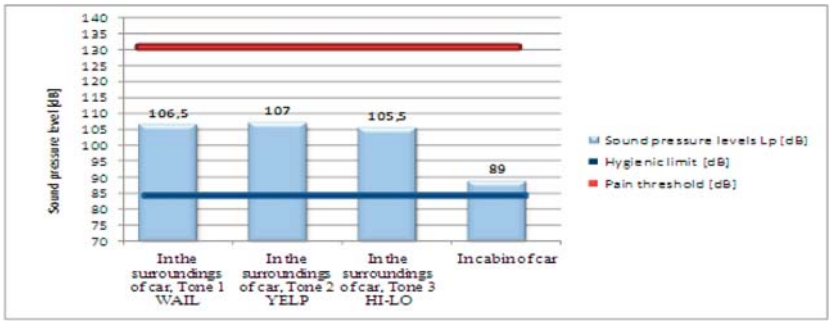
Recalculated levels of sound pressure and power for all siren tones in the case of three measured lightbars are plotted in Graph 4.

The comprehensive results of measurement in the framework of the study confirm that *there are not any significant acoustic differences between the measured audible and visual warning devices.* The majority of advanced sirens are controlled by a microprocessor; a certain standardization of tone has occurred. For this reason, measurement results could be used for the evaluation of frequency ranges of siren tones. In addition to the measurement of sound pressure level, percentile levels were another measured parameter. For the evaluation of frequency range of tones of the three siren types, results of measurements made at a distance of 3 m from the lightbar were used. Switching between the tones was possible thanks to the control unit [3].

WAIL is a continuously variable tone, which imitates the sound of a motor siren. The frequency range of tones of sirens 1 and 2 is 540 – 1500 Hz. The frequency range of tone of siren 3 is 780/1040 Hz. The greatest sound transmission loss occurs in the siren tones at a frequency of 1600 Hz. This frequency will be, in contrast to the other frequencies, least audible over long distances. The least sound transmission loss occurs in the siren tones at a frequency of 500 Hz. To be able to distinguish safely a siren tone a person has to hear all its frequency components. Furthermore, a sufficient difference between the sound pressure level and that of the background has to exist. In accordance with technical standards, the difference of 10 dB can be taken as sufficient. From the legislative requirements follows that the minimum value of sound pressure level of the audible and visual warning devices is *105 dB*. From the previous measurements it follows that the sound pressure level of background of *70 dB*. The highest joint frequency of the tones of sirens 1 and 2 is the frequency of 1500 Hz. For this value any tabular value of sound transmission loss does not exist, and for this reason, the closest possible value, i.e. 1600 Hz was selected. If we take the frequency from the greatest transmission loss (1600 Hz), a distance over which the siren tone will be audible can be calculated in a simplified way. A difference between the sound pressure level of the siren and that of background is $\Delta L = 35$ dB. A similar situation is there with the HI-LO tone of siren 3. The highest frequency of the tone of siren 3 is the frequency of 1040 Hz. For the WAIL and YELP tones, the range of audibility is theoretically 5 km, for the HI-LO tone about 7 km. The determined range depends considerably on atmospheric conditions and operating environment. In the course of application of warning siren tones in a town, all the siren tones cannot be recommended wholly without fear. This fear is caused by a long repetition period of the WAIL tone. The repetition period of the WAIL siren tone is 4 s. Other road users need not notice any warning signal before an increase in maximum sound pressure level. A situation may occur when the other road users do not yield the right of way to a police car. This risk increases especially in the course of crossing junctions in high-density built-up areas of towns. Acoustic shadows caused by buildings may occur. There is a risk of tragic events and a recommendation is to select a tone with a rather short repetition period of siren tone, e.g. YELP, HI-LO, before passing the junction. In a free space, all siren tones of the audible and visual warning device concerned can be used.

All the types of measured lightbars satisfied the legislative requirement for the lower level of sound intensity of these devices. The legislative requirement determines the value of 105 dB (A) as a minimum and a hemispherical surface of a radius $r = 2$ m surrounding the audible and visual warning device fulfils it. From the resultant calculated values of sound power, only negligible differences on the level of measurement uncertainties were found between the audible and visual warning devices.

In the framework of the study, the evaluation of effects of sound of the audible and visual warning devices used on persons



Graph 5 Average levels of sound pressure of VSL 012VL

in the close vicinity of the audible and visual warning devices was carried out. The average value of sound pressure level at a distance of 3 m from the car is 99.7 dB (A). The average value of sound pressure level in these measuring points is 96 dB (A). The measured value at a distance of 3 m is smaller than the threshold of pain; however it is necessary to emphasise cumulative effects of noise on the auditory organ. A decrease in acuity of hearing takes place after long-term exposure to noise the values of which exceed the hygienic limit of 85 dB (A) per shift. [6] Measurements and evaluations of sound pressure level in the closed cabin of the car at switched on audible and visual warning devices were carried out; subsequently, the sound pressure level at the switched on audible and visual warning devices is up to 25 dB (A), which indicates a high level of sound insulation of vehicles used. The achieved decrease is however on the level exceeding the hygienic limit per shift. In Graph 5 an overview of values of sound pressure level determined at various siren tones in the case of lightbar VSL 012LV is presented

Although we do not expect that a member of the Police of the CR is subject to such exposure for the whole shift, it is necessary to be concerned with the duration of the exposure per average characteristic shift, because the use of adequate hearing protection as e.g. in industrial conditions is out of the question. What is a solution is the determination of recommended time of work in the cabin and also outside the cabin at the switch on audible and visual warning devices. The calculated recommended time of working in the surroundings (within the distance of 3 m) at the switched on audible and visual warning devices is *3.4 min as a maximum*. The calculated recommended time of work in the cabin of the car at the switched on audible and visual warning devices is *186 min as a maximum*. This time represents the maximum allowable time at everyday use of the siren to avoid the exceeding of hygienic limits. [3]

7. Conclusion

The study in real conditions has verified acoustic characteristics and parameters of audible and visual warning devices used commonly on vehicles of the Police of the CR. The obtained results can be the basis for further verification of other both used and new audible and visual warning devices in various conditions of use, e.g. in high-density built-up areas. When evaluating the effects of noise on members of the PCR, the amount and the severity of noise exposure as well as the reasons for the use of audible and visual warning devices designed for application in the interests of averting the impending hazard are to be considered.

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ULTRAVIOLET RADIATION – LEVEL OF KNOWLEDGE AND HEALTH PROTECTION OF COLLEGE STUDENTS IN SLOVAKIA. AN EDUCATIONAL-QUESTIONNAIRE STUDY

It is generally acknowledged that there is a correlation between the incidence of ultraviolet burden diseases and overexposure of the body to ultraviolet radiation (UVR). The main goals of our study were to determine the level of knowledge of college students in regard to the effects of UVR, to educate them about it, and finally to urge them to improve their personal protection against the harmful effects of UVR. We performed an educational-questionnaire study of UVR in 2003, 2005, and 2008 years. Responses of 841 students from Jessenius Faculty of Medicine in Martin (JFM), University of Zilina, and St. Elizabeth College of Health and Social Work (SEC) in Bratislava showed a higher level of knowledge in students at JFM and Univ. of Zilina following their education, as compared to those students from SEC. There was little difference in responses to questions related to the protection against UVR. A lower level of knowledge in all groups of students was shown in 2005. Nevertheless, all respondents significantly increased their level of protection against UVR during the years of the study and the number of those visiting solaria decreased. A weak relationship between the knowledge of students and their protection skills against UVR was found, indicating that a complex reason might be involved. This study highlights the importance of providing education that is systematic and long-term to university students in Slovakia (future doctors, bioengineers and nurses). Moreover, this study brings new insights on the surveillance and protection against the harmful effects of UVR to prospective patients.

Key words: *Ultraviolet Radiation, Knowledge of College Students, Sunburn, Public Health Protection, Sunbeds, Questionnaire*

1. Introduction

The damage to the human body by ultraviolet radiation (UVR) is a serious medical threat. UVR as a kind of non-ionizing radiation is essential for health, but excessive exposure poses health risks that may result in diseases, such as a malignant cutaneous melanoma, squamous and basal cell carcinomas, sunburn, solar keratoses, cortical cataract, pterygium, ocular melanoma, carcinoma of the cornea and conjunctiva, a reactivation of herpes labialis, suppression of the immune system, a premature skin aging, etc. [1], [2], [3]. In this respect, the higher intensities of mostly UVR-B radiation reaching the Earth surface due to the reduced concentration of an atmospheric ozone layer represents an important hazard to human health. The effective reduction of the stratospheric ozone concentration (below 220 Dobson units) was found in the Antarctica nearly 30 years ago [4]. Increased levels of UVR-B reaches its maximum between September and December [5]. Physical characteristics of UVR as well as the intensity of solar radiation are determined by the position of the Sun, by latitude, by specific conditions of the atmosphere and the Earth surface, time of exposure, meteorological conditions, and some additional environmental factors [6], [1]. The strict implementation of the Montreal Protocol on Substances that Deplete the Ozone Layer [7] needs to continue in order for the UV- protective ozone layer to eventually recover. The prevention of serious UVR-related diseases would not be possible without the complex study of UVR, which will enable a clearer understanding of its effects on the human body [8], [9]. Evidence suggests that repeated sunburns in particular during childhood and adolescence are linked to serious skin cancers (invasive melanomas and non-melanomas) in children [10] and in relatively young people aged under 55 [2], [11]. Some of these diseases seem to be related to hereditary factors, the sensitivity of particular skin (photo)type, colour of hair, the number of pigment naevi, life style, health habits, quality of environment, protection skills, and some other factors. In Slovakia for example, in the years of 2006, 2007, and 2008, the incidence (a number of new cases/year/10000 citizens) of malignant melanoma and other invasive skin cancers was 51.4, 54.8, and 54.5, respectively [12], [13], [14].

Without proper education that will increase individual awareness and teach effective personal protection, a substantial reduction of health damage to the population due to the UVR overexposure is impossible. Some regulations such as control and even bans on the use of solaria by children and teenagers were adopted. However, national surveys in Europe have indicated that 9–16% of people still use tanning appliances but that usage among teenagers can

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reach 30% or more [15], [16], [17], [18]. A reduction of the use of solaria in 2004 (18%) as compared to 2001 (27%), however, was also documented [19].

The goal of our study was to use an educational-questionnaire method in order to provide a systematic educational program and then to make an assessment of the level of student knowledge regarding the physical and biological effects of UVR on humans. We also evaluated their behavioral skills related to protection against UVR. As a consequence to the UVR educational program, we expected students to be more knowledgeable and to show more skill in protecting their health and to reduce attendance to the solaria.

2. Material and methods

Our study was performed in the years of 2003, 2005, 2008 at three Slovakian universities: at the Jessenius Faculty of Medicine, Comenius University (JFM) in Martin, at the University of Zilina (in a program of biomedical engineering), and at the St. Elizabeth College of Health and Social Work (SEC) in Bratislava. The point was to educate the college students, and then determine their knowledge and personal skills in protecting themselves against harmful effects of UVR. A total number of 841 college students (Tab. 1) were involved. The average age of our respondents was 22 years. The study included 701 (83.3 %) females and 140 (16.7 %) males. The ratio of females to males in the individual years of 2003, 2005, and 2008 were: 275 (88 %) and 36 (12 %), 311 (85 %) and 56 (15 %), 115 (71%) and 48 (29 %), respectively.

The counts of university students involved in the study Table 1.

University	Students in the year						Together	
	2003		2005		2008			
	#	%	#	%	#	%	#	%
JFM Martin	311	37.0	287	34.1	116	13.8	714	84.9
Univ. of Zilina	0	0	28	3.3	47	5.6	75	8.9
SEC Bratislava	0	0	52	6.2	0	0	52	6.2
Together	**311**	**37.0**	**367**	**43.6**	**163**	**19.4**	**841**	**100**

Students freely answered an anonymous questionnaire containing both epistemic and informative parts. The epistemic part consisted of 24 questions with an option to answer "yes" or "no". These questions referred to the physical properties and biological effects of UVR, as well as to the protection available against health damage caused by UVR (Tab. 2). The questions were based on the standard medical textbook of Hrazdira [20]. At JFM in Martin and University of Zilina, our specific UVR education was fully covered by mandatory lectures of medical biophysics (the lectures were basically identical in the years 2003, 2005, and 2008) provided by ourselves. In addition to the medical textbook, students from 2005 at the above mentioned three universities could use additional literature [21]. The students at SEC in Bratislava obtained the comparable lectures and literature. Respondents were notified about the topics of the questionnaire. Students of JFM and University of Zilina obtained the questionnaire four weeks following the last lecture of our specific UVR subject. The informative part of the questionnaire dealt with, among other things, the skin type of students, the possibility of sunburn(s) during either the childhood, pubescence, or adolescence, their attendance to solaria, and the character of protection they used against UVR (behavior during tanning, number of visits, a quality of their sunscreans, sunglasses, dress, hats, etc.).

Respondents returned 92.3% of the questionnaires, 96% in 2003, 94% in 2005, and 87% in 2008. The data was processed by the PC program ORIGIN 5 Professional and GraphPad InStat. Success rates (percentages) were calculated for each answer (number of correct answers/number of students). The mean values $\pm$ SE of the success rate were then calculated by averaging all the 24 questions. Repeated measures ANOVA (GraphPad InStat) with Student-Newman-Keuls post tests were used to test the statistical significance of differences. The informative part of the questionnaire was processed by analyzing the contingency tables using chi-square and Fisher's tests. Linear regression for trends of increases or decreases in the years 2003, 2005, and 2008 was also accomplished. The level of statistical significance was set at $p < 0.05$.

3. Results

In 2003, the respondents (311 students of JFM) reached a 87.4 $\pm$2.1% success rate (in average 21.0 out of 24 answers were correct). In 2005 (Tab. 3), 367 students of all three universities (see Tab. 1) reached a 78.2 $\pm$3.2% success rate (18.8 correct out of 24 answers). The lowest success rate reached were students from SEC in Bratislava, a program which did not cover our specific UVR subject (Tab. 3). The differences among universities were much less obvious in regard to questions N^o 19 to 24 (related to the protection against UVR) while our students aswered differently in questions N^o 1 to 18 (associated with theoretical knowledge about UVR; Tab. 3). In 2008, a total of 163 respondents (students of JLF and University of Zilina) answerred 88.0 $\pm$1.7% correctly (21.1 correct out of all 24 answers). The comparison of success rates among related years showed a lower level of student knowledge in 2005 (Tab. 4). This finding was also confirmed by the comparison of the students (JFM and University of Zilina) that were educated in our specific program (Fig. 4) and by a separated analysis of questions N^o 1 to 18 (theoretical knowledge). No significant difference in the success rate among the years was found for questions N^o 19 to 24 (protection against UVR; Tab. 4)

The queries of the informative part of the questionnaire revealed an increased number of students who did not attend solaria in the successive years of 2003, 2005, and 2008 (61 %, 70 %, and 87 %, respectively; Fig. 1; correlation coefficient 0.998, $p = 0.039$). The number of those only seldom attending the solaria gradually decreased in the years of 2003, 2005, 2008 (36 %, 25 %, 12 %, respectively; Fig. 1; correlation coefficient 0.998, $p = 0.043$). In our study, only females reported to visit the solaria.

The list of questions under the epistemic part of our questionnaire with correct answer within parenthesis. (Y), correct statement; (N), incorrect statement

Table 2.

1)	UVR is electromagnetic waving with the wavelength of 100 to 400 nm (Y)
2)	UVR is ionizing radiation (N)
3)	UVR is non-ionizing radiation (Y)
4)	UVR is component of solar radiation (Y)
5)	An artificial source of UVR is light bulb and neon lamps (N)
6)	UVR is produced by mercury lamps (Y)
7)	There is only one type of UVR (N)
8)	There are two types of UVR (N)
9)	The wavelength of UVR is important and this determines its biological effects (Y)
10)	Biological effects of UVR depend on its intensity, the duration of exposure, the atmospheric ozone concentration. (Y)
11)	Ozone layer enhances effects of UVR (N)
12)	The reduction in ozone layer (ozone hole) can contribute to the induction of skin cancer (Y)
13)	Exposure by UV induces tan of skin by melanin production within the melanocytes (Y)
14)	UVR predominantly induces heating in the skin (N)
15)	The pigmentation usually follows the erythema (Y)
16)	Overexposure by UVR during the tanning usually does not induce any damage (N)
17)	Acute effect of overexposure by UVR is solar dermatitis (skin inflammation) (Y)
18)	Chronic exposure by UVR causes early ageing of skin and increases a possibility of skin cancer (Y)
19)	A protective factor of sunscreans expresses the number – how many fold longer time can one stay under the sun without any risk of skin damage (Y)
20)	The lower protective factor of sunscreans, the better protection of the skin (N)
21)	Using the sunscrean with higher protective number, the erythema and pigmentation happen later (Y)
22)	To protect body against UVR one can reduce the exposure to solar radiation between 10 a.m. and 2 p.m. (in the middle Europe) (Y)
23)	To protect body against UVR one can use sunscreans with low protective factor enriched with vitamins (N)
24)	To improve the protection of humans against UVR it is strictly recommended to stop the tanning of newborns and nurslings, as well as the humans treated with antibiotics, sulfonamides, etc. (Y)

The level of students knowledge relative to UVR at 3 universities in 2005.

Table 3.

University	Correct answers out of 24	Success rate [%] mean±SE	Questions Nº 1 to 18		Questions Nº 19 to 24	
			Correct answers out of 18	Success rate [%] mean±SE	Correct answers out of 6	Success rate [%] mean±SE
Univ. of Zilina	21.8	90.9 ± 2.4	16.0	88.9 ± 3.0	5.8	97.0 ± 2.3
JFM Martin	19.0	** 79.3 ± 3.2	13.8	** 76.5 ± 3.9	5.3	87.7 ± 4.1
SEC Bratislava	16.5	*** ++ 68.9 ± 5.4	11.6	*** + 64.6 ± 6.8	4.9	* 81.7 ± 5.2
Together	**18.8**	**78.2 ± 3.2**	**13.6**	**75.8 ± 4.0**	**5.1**	**85.5 ± 3.7**

*, **, ***, $p < 0.05$, $p < 0.01$, $p < 0.001$ comparing with University of Zilina; +, ++, $p < 0.05$, $p < 0.01$ comparing with JFM Martin.

Similar to previous findings, the number of students that did not use any protection against UVR have decreased during the course of our study in 2003, 2005, and 2008 (12 %, 4 %, and 2.5 %, respectively; Fig. 2). The numbers of respondents that used sunscreans, hats and clothes were higher in 2008 comparing with 2003 and 2005 (Fig. 2). Among our respondents – females used mostly sunscreans as UVR protection (about 1.5 fold more than males). Males preferred sunglasses (about 1.2 fold more of them) and hats with clothes (about 2.2 fold more of them). On the other hand, the number of males that did not use any protection against UVR was about six times more than in females.

We found no significant differences in percentages of respondents visiting (avoiding) solaria, and in the precentages of those using (not using any) protection against UVR among the students at three universities passing our study in 2005.

The comparison of level of students knowledge in years 2003, 2005 and 2008. Table 4.

Year	All students		Students of JFM and Univ. of Zilina	
	Correct answers out of 24	**Success rate** mean ± SE [%]	**Correct answers** out of 24	**Success rate** mean ± SE [%]
2003	21.0	87.4 ± 2.1	21.0	87.4 ± 2.1
2005	18.8	78.2 ± 3.2 ***	19.3	80.4 ± 3.1 **
2008	21.1	88.0 ± 1.7 +++	21.1	88.0 ± 1.7 ++
Questions 1 to 18	**Correct answers** out of 18	**Success rate** mean ± SE [%]	**Correct answers** out of 18	**Success rate** mean ± SE [%]
2003	15.6	86.6 ± 2.5	15.6	86.6 ± 2.5
2005	13.6	75.8 ± 4.0 ***	14.0	77.6 ± 3.7 **
2008	15.6	86.6 ± 2.0 ++	15.6	86.6 ± 2.0 ++
Questions 19 to 24	**Correct answers** out of 6	**Success rate** mean ± SE [%]	**Correct answers** out of 6	**Success rate** mean ± SE [%]
2003	5.4	90.0 ± 4.2	5.4	90.0 ± 4.2
2005	5.1	85.5 ± 3.7	5.3	88.6 ± 3.9
2008	5.5	92.2 ± 2.7	5.5	92.2 ± 2.7

**, ***, $p < 0.01$, $p < 0.001$ comparing with 2003; +++, ++, $p < 0.01$, $p < 0.001$ comparing with 2005

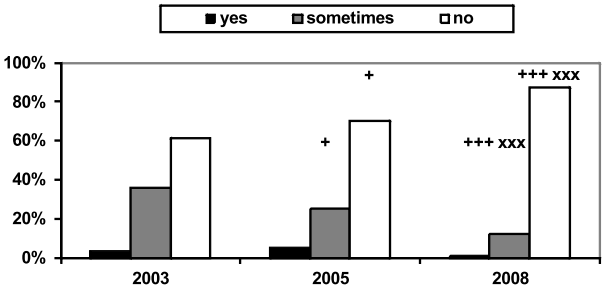

Fig. 1. Percentages of university students attending solaria in years 2003, 2005, and 2008. +,+++, $p < 0.05$, $p < 0.001$ comparing with 2003; xxx, $p < 0.001$ comparing with 2005

Among our respondents, 586 of 841 students (69.7%) knew their skin type, 213 of them (25.3%) did not know their skin type, and 42 students (5.0%) were not familiar with the term "(photo) type of skin". 108 students reported never to have been sunburt (12.8 %), and 439 respondents (52.2%) reported having been sunburnt during their childhood. The rest of the participants – 294 students (35.0%) reported solar skin trauma mostly in adulthood.

4. Discussion

UVR exposes everyone to both positive (Vitamin A production, an increase of imunity, behavioral aspects) and negative impacts

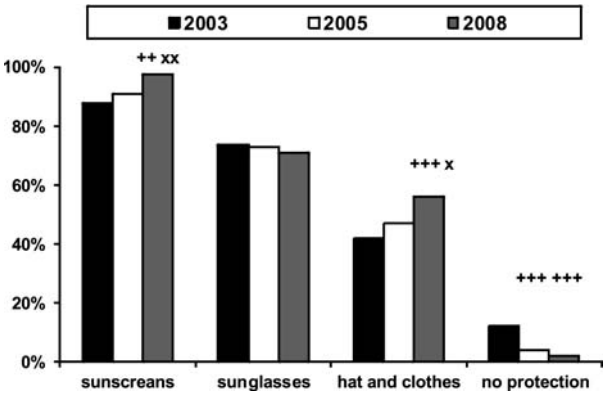

Fig. 2. Protection against UVR used by students in years 2003, 2005, and 2008. ++, +++, $p < 0.01$, $p < 0.001$ comparing with 2003; x, xx, $p < 0.05$, $p < 0.01$ comparing with 2005

(disorders of skin, eye, imunity, etc.). Thus, overexposure to natural solar radiation and/or to artificial UV radiation produced by industry or solaria is potentially risky for individuals and thus for public health [22], [23], [24], [25], [26], [27]. Our assessment of three groups of the Slovak college students (future medical doctors, bioengineers and nurses) was the first attempt to enhance the level of their knowledge, to raise protection against the harmful effects of UVR, to decrease the visits to solaria, and to provide relevant information that they will pass on to their prospective patients.

The students of JFM and University of Zilina were educated by our lectures on the specific UVR subject (textbooks and Internet were also available). Students responded to our questionnaire four weeks (self-education period) following the last lecture. However, students from SEC did not take part in our lectures and thus their knowledge on the topic was proved significantly lower. This confirmed that regular education significantly contributed to a higher level of knowledge obtianed by our students (Tab. 3). All respondents showed appropriate knowledge about protection against UVR, including the safe time for natural tanning, protective factor of sunscreans, etc. However, questions related to behavioral skills to UVR among particular respondents from the three universities were much less in proportion to the whole set of questions (Tab. 3). Following this, no differences in the level of protection used against UVR among the students of all three faculties were found. In comparing the years 2003, 2005, and 2008, a significantly lower level of knowledge of our respondents was proved in 2005. The analysis of only JFM and Univ. of Zilina students confirmed this finding (Tab. 4). We attempted to separate groups of students (medical program, nursing program, biomedical engineering program, etc.) in order to determine if some of these student groups contributed to the result. However, similar trends were shown between all respondents and all student subgroups (JFM and Univ. of Zilina) that have been educated in our UVR program (Tab. 4). Thus, an objective reason for the lower level of student knowledge in 2005 retains unknown. We propose multiple reasons for the 2005 result, some of which may be due to the differences and vari-

ability of a high school education, access to public information and/or public education about UVR specifically, and a variable degree of interest that may exist between people in protecting their own health. The low level of knowledge found in the 2005 group urged us to modify the content of the specific UVR subject. We prepared handouts for students on the topic and gave them more time to both gather information and for discussion in order to make our educational method more effective. This arrangement could have contributed to the significant improvement of knowledge of the respondents in 2008 (Tab. 4).

Our findings revealed that there was a very weak correlation between the students' knowledge and the protection against the negative effects of UVR (e.g. lower or equal knowledge found in questions N0 19-24 and the increased protection in 2005 comparing with 2003; similarly, the equal knowledge but increased protection in 2008 in comparison with 2003). However, in our previous study [28], in 168 inhabitants in the areas of Ružomberok and Liptovský Mikuláš who did not receive specific UVR education, more than 16% of inhabitants did not use any kind of UV protection (it was approx. 6.4 fold more than it was found out in our students in 2008). Also the level of general (i.e. elementary, high school or university) education may greatly affect the quality of UV protection used. In this respect our former study [29] concerning UV protection proved that medical staff in hospitals protected themselves in 95% of cases, and the medical doctors in 100% of the cases. Along with this, the present study also confirmed the higher level of knowledge and responsibility by students having high school and university education.

It was interesting to find that few of our respondents regularly visited solaria (in 2008 only 1%, compared to 5% in 2005) and also the number of all students attending the solaria seldom have also decreased during the years of our assessment. This is the most promising trend because in some European countries (particularly Northern Europe) there is still reported a high prevalence of those taking artificial sunbath in solaria [11], [16], [17], [18], [30]. Nonetheless, there is still an increase in the number of solaria per year. For example, in 2008 and 2009, the total number of licensed solaria in Slovakia was 761 and 823, respectively (personal information from Slovak Ministry of Health). It is recommended that solaria be registered, solaria staff provided with professional education, that a systematic control of solaria operation be put in place, and visitors be given instruction that must include information about protection (particularly wearing sunglasses). Tanning per se always implies damage to cellular DNA in the skin with unpredictable long-term consequences. As a precaution, it would be prudent to reduce yearly doses as much as possible. Some epidemiological studies indicate an increased risk of malignant melanoma if a person has more than 10 sessions in a solarium per year e.g. [15].

It is necessary to know skin type in order to make correct calculations regarding reasonable durations of UVR exposure. In the present study, almost 30% of our respondents did not know their skin type nor did they know that there are various skin types to be considered. Thus, to prevent damage due to UVR exposure, it is essential that students of elementary and high schools, if not the whole population, should be educated on this point.

The present study also showed that males preferred protection through sunglasses and clothes whereas females preffered sunscreans. This is congruent with simillar studies performed in Europe [31] and in the USA [32]. It was perturbing to find that almost 52% of our respondents suffered from sunburns in their childhood. This fact clearly indicates a low level of public knowledge about UVR and/or ineffective protections used against UVR for the citizens of Slovakia mostly in the period of 1980–1990. Our study also emphasizes the need for education and the formation of new habits in protecting children and youngsters. Such habits need to be taught, encouraged and strengthened also in their parents, teachers, medical staff, public health professionals and other representatives. Our results support the findings that there must be more knowledge about UVR and an adjustment made to the "outdoor – indoor" exposure to UVR in children [23], [33], [34], in adolescents [35], [36] and in college undergraduates [37]. Only a systematic and long term educational program, along with comprehensive protection policies, will reduce the burdens of diseases resulting from excessive exposure to UVR. Our future studies will continue to target children in elementary schools, as well as young people (15–24 years) of both genders, as they are relatively more careless about exposure to the sun and UVR from solaria.

5. Conclusions

This comprehensive study stressed the importance of a long term and systematic approach to education of college students in Slovakia (future doctors, bioengineers, and nurses) in the specific field of UVR, and the importance in improving the protection mechanisms against the harmfull effects of UVR. Our study proved an increased level of protection by university students during the six years of their systematic education. However, the quality of their personal protection does not correlate with the level of their knowledge, which was obtained during their education. It is very probable that UVR will significantly affect the health of the general population in the coming years. Therefore, we propose developing and establishing a reactional approach to UVR exposure. This reactionary approach would include a systematic educational program for the general public, including children, young people, undergraduates, their teachers, etc., which will result in improved habits of protection against UVR exposure, along with producing health care professionals who are more aware of UVR, its dangers, and who will encourage prevention.

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Milan Mikolas – Roman Donocik – Jana Bartonova – Michal Vanek – Martin Mikolas *

MONITORING OF DILATION CRACKS AND VIBRATIONS CAUSED BY BLASTING WORKS AT THE QUARRY OF MOKRA ON SURROUNDING CONSTRUCTION OBJECTS

The quarry of Mokra, whose locality comprises administrative area of three communities, has cooperated with our Institute for a longer time, communicating with the authorities and people, as regards environmental safety and quality of living in the area. Monitoring of the conditions by continual measurements of dilation cracking and blasting works seismic effects has been an indispensable part of the collaboration.

The measurement equipment was developed especially for the needs and condition of the quarry of Mokra, but can be used universally. This paper reports on technicalities of its development and experience of using it in practice.

Key words: *seismic effect, dilation, vibration, blasting works, sensors, data file.*

1. Introduction

Blasting works necessarily imply collateral damage of different rate. This is influenced by many factors – local geological condition, weather, technical parameters of blasting works, but also by the quality of the buildings affected. From the side of general public, they are seen as detrimental by all means, although they can be within authorized limits of standards.

Considering the fact that also in future blasting will stay to be a principle method of rock extraction, and consequent collateral damage cannot be excluded but only regulated, an existence of a quality system of damage measurement is of major importance. Reliable data provided on the matter will definitely be concurrent to all arising problems and possible remedying action – instant or prospective.

2. Continuous Measurement of Dilation Cracks and Vibrations

2.1. Measurement System Requirements and Measurement Principle

As already mentioned, quarry blasting works can have adverse seismic effects on buildings in their vicinity. These seismic effects decrease exponentially with the increasing distance of objects from the blasting action. The stability of construction objects can exceed limits of tolerance when physical magnitudes of related parameters get over defined standards. Cracking is the initial indication of a building static damage. The cracks can be caused by static or dynamic forces. Affecting building foundations, unstable subsoil static forces can cause cracking in absence of any seismic load. The seismic load tolerance limits on construction objects are defined by the State Standards. Apart from subsoil instability, also temperature changes can influence cracking.

To be able to differentiate seismic dynamic loads caused by blasting from other sources of dynamic or static loads on buildings, it is necessary to develop a specific measurement system that would continually and concurrently monitor visually identifiable and measureable dilation cracks caused by dynamic forces (tremors) of blasting works.

Measurement and evaluation units:

Dilation gauge, Vibration gauge, Gauge service circuits, Timing circuits, Signal transmission modules, Long service power-supply unit, Initiating programme module, Microprocessor SW for measurement and control circuits, Data computing gear, Reliable protection of equipment inclusive its fixing

3. Dilation measurements

Enclosed in a waterproof housing, two dilatometers are installed at each measurement point.

Basic operation requirements:

– Uncertainty of measurement	5 %
– Maximum measurement range	15 mm

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- Working temperature from −10 °C
- Sensor attachment spacing 200 mm

Individual sensors are attached by 2 ball joints. The sensors are perpendicular to each other. They both traverse the dilation crack measured. The dilation outcome value is calculated by vector analysis so that the results reflect the linear shift perpendicular to the dilation tangent and concurrent linear movement at the same point. The outcome file dilation values are provided in units and tenths of millimetres. The sensors are connected to the measurement unit by an electrical cable.

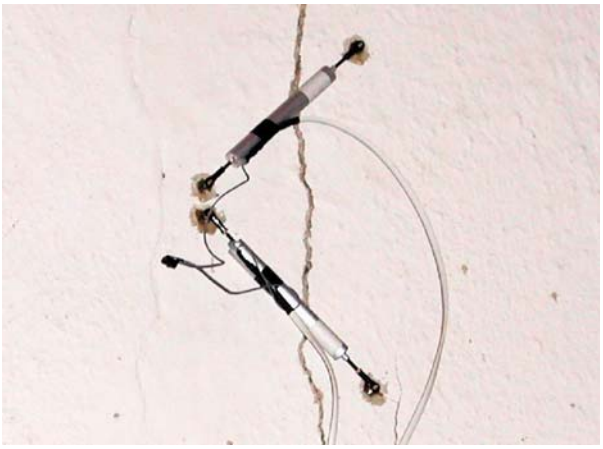


Fig. 1 Installation of dilatometers at measurement point

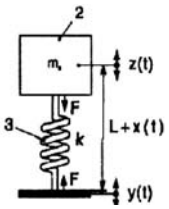
4. Vibration gauge

The vibration gauges are placed in a box that is permanently fixed next to the dilation sensors. The sensors are vertically and horizontally oriented respectively. The vibration gauges are constituted by two piezoelectric accelerometers. Nevertheless, the required parameter for seismic effect evaluation of blasting works on construction buildings is the speed of vibration. As such the piezoelectric accelerometers must be completed by integration circuits that can transfer with satisfactory accuracy the values of mechanical acceleration to values of vibration speeds. The levels of electrical input values for integrators must be amplified.

Basic operational requirements:
- Uncertainty of vibration speed measurements 5 %
- Frequency range 10 – 1000 Hz
- Operational temperature from −10 °C

As ambient air-pressure changes could adversely affect the vibration readings, a solid mechanical attachment of the vibrometer body to the measured medium must be provided for.

The simplest method of vibration acceleration measurement is to put a load, m, on a spring of characteristics, k. The spring oscillation displacement is x. It is valid that



Vibrating element

Where: 2 Solid body with mass, m
3 Spring with elasticity constant, k
F Spring force, F, affecting the solid body, 2
L Distance between the solid body surface and central mass point
$z(t)$ Position change with time,t
$y(t)$ Change of the position of the vibrating body
$x(t)$ Change of distance, L, with time, t

Fig. 2 Vibrometers

$$F = k \cdot x,$$

F – Force vector [N],
k – Spring characteristics [Nm^{-1}]
x – Vector of magnitude (and direction) of the spring mass point [m]

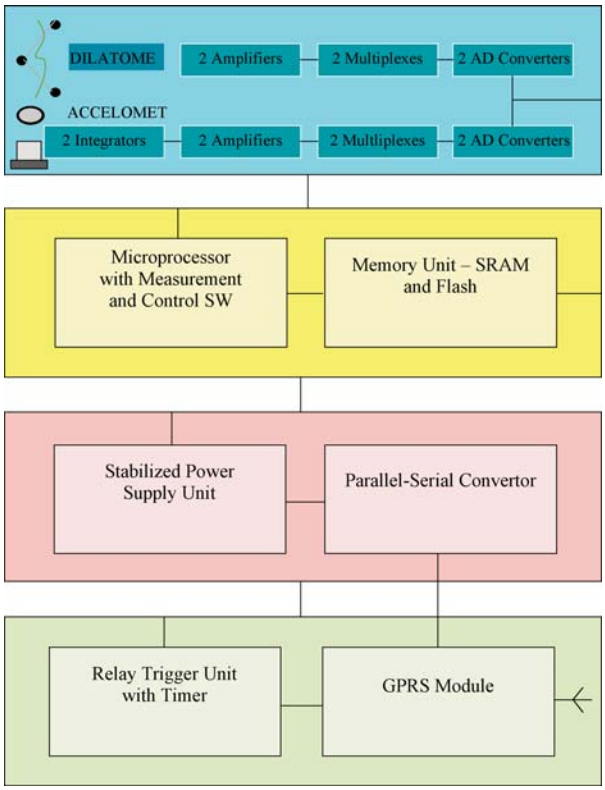
5. Calibration of sensors

The accelerometers had been calibrated by a standard vibrometer before being put in their casing box. Before their assembly in situ, the dilatometers, inclusive the reference voltage source had been calibrated by a standard slide calliper:

Fig. 3 Standard Vibrometer's Calibration

Fig. 4 Secondary Length Standard Micrometer for Calibration of Sensors

6. Measurement Unit Block Chart



7. Measurement Site

In the photograph, we can see the installation of a measurement unit at a specific site. The positioning of sensors vis-à-vis the monitored crack is clearly illustrated. As already mentioned, the accelerometers are encased in the box, and as such, the box must be firmly attached to the wall so that no distortion of original information occurs. The best attaching technique is to cement the box onto the wall. As continuous measurement assumes long term monitoring action, also weather conditions must be taken into account as well as human factor influences. For example, the measurement installation could be unintentionally damaged during maintenance works at the site.

Fig. 5 Installation of a measurement unit

Another limiting factor of the proper installation can be also posed by options for possible wireless transmission of monitoring data. The quality of installation and good wireless transmission of measurement signals can decisively affect reliability and accuracy of the monitored data. The measurement site should satisfactorily represent typical condition of the monitored building object, facilitating objective assessment of the seismic effect of blasting works on the building monitored. Such prerequisites ask for a thorough on-the-spot inspection and identification of the place, in which dilation cracking may occur.

8. Measurement and Assessment Circuits

All functions of the measurement system are controlled by an 8-Bit industrial microprocessor. This chip, apart from the classical x80 core, must comprise four pieces of 12-Bit approximation analogue-to-digital convertors with amplifiers, also minimally three pieces of 8-Bit input/output ports, a serial UART circuit, a precise clock oscillator of the computer (no high tact time speeds are required, rather low current power feed, approx. tenths of mA, is more important). The processor should work at a feed power of 3 V.

The input ports receive signals from the dilation and tremor sensors for twelve hours, namely between 6am and 6pm every day. The signals are processed and maximum values of each 12-Hour measurement cycle, inclusive relevant timings, are recorded and transmitted in the form of a SMS to the receiver unit at night hours (cellular phone with an output for PC). The SMS transmitter is active only a few seconds daily so that power consumption is kept low.

Low feed power values enable long-term operation of the monitoring units (in fact several years if alkaline batteries are used).

The timing function is provided by a relay switch unit. The relay unit is controlled by the processor working on command of a specific programme. All timing data and measurement intervals are managed by a circuit of an accurate real time counter. A microprocessor input port receives the timing data needed.

An important part of the tremor sensors (vibrometers) is an integrating high input impedance charge amplifier. It converts vibration movement acceleration values to their related speeds. The mechanical vibration speeds are of decisive importance concerning monitoring and assessment of damage of building objects. If maximum vibration speeds exceed standard values, initial slight damage may occur.

For that reason, final output data of monitoring are regularly watched and seismic effect of blasting works is officially assessed.

Movement can be recorded:

$s(t)\ s(t) = \int v(t)dt$

$v(t)\ v(t) = \int a(t)dt\ v(t) = d\ s(t)/dt$

$a(t)\ a(t)\ a(t) = d\ v(t)/dt$

Where: $s(t)$ Distance with respect to time, t [m];
$v(t)$ Velocity with respect to time, t [m/s];
$a(t)$ Acceleration with respect to time, t [m/s^2];
t Time.

Transfers for harmonious signals (based on acceleration):

$a(t) = A \sin(\omega t)$

$v(t) = (-A/\omega) \cos(\omega t)$

$s(t) = (=A/\omega^2) \sin(\omega t)$

Where: $a(t)$ Acceleration with respect to time, t [m/s^2];
$v(t)$ Velocity with respect to time, t [m/s];
$s(t)$ Distance with respect to time, t [m];
A Amplitude of oscillation displacement;
ω Circular frequency;
t Time.

The measurements of vibration by accelerometers provide for the starting point of the whole monitoring process. The accelerometers are the most common sensors of largely different design. If damage effect of vibrations is monitored, the vibration speed – the so called vibration magnitude – is the best criterion. It enables usage of acceleration sensors with the following integration and aggregation. A direct usage of speed sensors is also functionally viable.

9. Dilation in Buildings

No-load effects, like volume changes due to changing temperature and humidity, rheological effects, and shape modification of foundations joints cause mechanical tensions in buildings that can many times exceed normal vertical load stresses or horizontal stresses of wind or multidirectional seismic stresses caused by blasting works.

In order to reduce these detrimental effects, it is of advantage to sectionalize the building construction, dividing the whole construction in smaller parts of different tendency to shape changes and of different settlement rate. Individual building sections are connected by construction (dilation) joints.

The construction joints should be located at places of extreme load occurrence, abrupt change of construction rigidity, change of construction system/design, sudden change of load, change of height or overall structuring, also in places of geological faults or irregularities.

Structuring of buildings in smaller parts is a preventive action that reduces probability of damage. Designing of construction joints also depends on the specific structure and rigidity of the supporting system. It is necessary to analyze effects of load, temperature, humidity, shrinking, shape modification and change of the foundation joint.

The temperature effect is of cyclic nature and changes volume and shape of buildings that many times behave like a beam, which expands or shrinks with changing temperature. If the temperature changes differ along the whole length of the construction unit, a characteristic deformation occurs – it bends. If humidity increases, porous materials start deforming; this may also mean increasing of their length. Effects of humidity are usually more pronounced than those of temperature.

The material shrinkage concerns volume changes due to humidity and the material inner structure.

The design of construction joints concerns primarily points of maximum strain or stress, like the points: Maximum pressure load, Maximum strain stress, Maximum shear stress.

10. Data Transmission

A 12-Bit approximation A/D convertor changes the dilation sensor values from digital to analogue form. The digitization is made to an accuracy of 0.01 millimetres. In fact, such high accuracy is not needed and after the vector analyses perpendicular to and along the dilation crack has been made, the final values are adjusted to sign sequences of the order, 0.1 millimetres before the subsequent conversion.

The outputs of the accelerometers are integrated by an analogue circuit to related vibration speeds. The seismic curve maps are not purely harmonious but of stochastic character, which implies an increase of uncertainty of mechanical oscillation measurement up to 5%. Nevertheless, a statistical analysis of the final data file excludes this uncertainty, and it cannot influence the ultimate assessment of the seismic effects of blasting works performed.

The signal sampling is 1 msec. This fully conforms to oscillation maps measured. After digitization, maximum amplitude values

of both sensors are chosen and they are converted to sign sequences of the order of 0.1 mm/sec.

Along with the dilation and maximum speed values, also part of the final numerical sign sequences are date and time of blasting works related to the seismic maximum. Assisting digital data, concerning identity of the specific measurement unit and the state of its batteries, are also included in the information sequence.

The data file numerical form is transferred from the microprocessor serial output (UART) to the transmission module (GPRS) for SMS communication, which follows at a pre-set night hour.

A common cellular phone equipped with an output connector for USB cable media date transmission to PC serves the purpose of the receiver.

This is an example of the SMS digital sign sequence of a specific measurement unit:

17152519141245564322

The sequence represents values in the following order:

17	Horizontal component maximum oscillation speed	v = 1.7 mm/s
1525	Horizontal component time record	15 H 25 MM
19	Vertical component maximum oscillation speed	v = 1.9 mm/s
1412	Vertical component time record	14 H 12 MM
45	Dilatometer value perpendicular to cracking	4.5 mL
56	Dilatometer value along the cracking	5.6 mL
43	Power supply voltage	4.3V
22	Measurement unit serial number	22

11. Data Processing

The SMS communication from the receiver is deciphered to provide for a PC data file. An assessment programme serves the purpose of the final data processing. The SW decoding unit not only deciphers the input digital sequence, but also performs other statistical and calculation tasks that can assess the rate of seismic damage of buildings. Apart from that, also relative movement of the dilation crack is calculated from the daily information provision by the dilatometers. The dilation crack values are related to the initial level of 0.0 millimetre dilation.

The calculation and check-up results are entered into working table files. Each major anomaly is related to standard levels of tolerance. If a standard tolerance is violated, the management of the quarry is immediately informed.

If dilation crack and vibration values are beyond limits of tolerance, a monthly monitoring report is produced giving maximum readings of all sites. A brief conclusive evaluation is also a part of the report. A continuous supervising of the batteries of all measurement units is another important part of the whole monitoring process (all measurement units have their own battery pack).

12. Evaluation of the Monitoring Results

To minimize seismic damage on buildings by quarry blasting works, there should be an instant feedback from the measurements units about the effects of the blasting technology used. Regular and systematic monitoring of blasting works seismic affects, which is based on measurements of the maximum vibration amplitudes, can authoritatively decide on the stability of the building objects seismically affected by blasting. The measurement feedback can influence options of the blasting works, concerning timing of individual blasts, their mass, explosive agent quality, and drilling schemes used. Local geological conditions are of major importance, as regards propagation of damaging seismic waves. Although, these conditions cannot be influenced, nevertheless, they must be accounted for in the overall assessment of the damage caused by blasting.

Authorized measurements of technical tremor caused by blasting works are precisely regulated by legal and metrological measures. The results of these measurements influence decisively the method of blasting works used or imply necessity of its change. The authorized measurements are performed in relatively long time periods (once or twice in a year) and hardly can account for all the aspects of the complex occurrence.

A continuous and permanent monitoring of blasting works effects (monitoring of dilation cracking and vibration magnitudes at specific sites of the buildings exposed) is needed. It is precise and can provide for conclusive evidence if authorities are faced to decide about complaints and claims of the proprietors of the buildings damaged. Only modern IT communication services, which work on wireless principle, and fast computer processing, can provide for instant feedback and conclusive objective evidence needed.

The article is based on seismic measurements of organizations Ceskomoravsky cement, a.s., nastupnicka spolecnost, Mokra and MET-ROCK, s.r.o. It is based on original measurement and therefore the article does not contain any references to literature.

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DESIGN CALCULATION MODEL OF THREE-LAYER COMPOSITE REINFORCE CONCRETE STRUCTURES

The three-layer structures with a thermal insulation layer of small strength concrete keep the intermediate place between the standard reinforce concrete structures and composite constructions. The calculation model in which the cross-section of three-layer structure is substituted by I-beam homogeneous section of imaginary higher strength concrete is selected. The executed analysis have verified the possibility to use the I-beam transformed section model even for the calculation of three-layer composite reinforce concrete structural elements.

Key words: *layer structure, reinforce concrete, modular ratio transformation, structural deflection, effect of shear force, bending stiffness, analysis model.*

1. Introduction

The three-layer structure with the thermal insulation coating of low strength concrete can be ranked to the special reinforce concrete structure type. It keeps the intermediate place between the standard reinforce concrete structures and composite cross section structures with reinforce concrete external layers and the low strength and high deformable thermal insulation one in the middle. For the standard reinforce concrete structure computation, the plane-sections hypothesis can be generally used. During the deformation process according to this hypothesis, cross-sections are supposed remaining plane and perpendicular to the element axis i.e. it is supposed that the vertical shear is absent. The three-layer structures with the inner layer of low shear modulus of elasticity are calculated using the theory of composite struts. According to this theory, the action of each separate bar incorporated in composite entire strut is treated in accordance with the law of resistance of materials, especially applying the plane-sections hypothesis. The strut materials should follow the Hook's law up to the specified limit. Further than this maximum value, the plastic deformations appear.

In the case of a rigid connection all over entire length of the parts of the composite element, the final resulting structure can be considered as single common monolith element despite the fact that different parts of its cross section are produced from different materials [1]. The successive casting of the layers in the general technological cycle, producing three-layer external reinforce concrete structural part can provide monolithic nature of the section thanks to reliable connection of the external and internal concrete layers.

2. Calculation model development

During experimental testing of three-layer beam-type samples as well as structural parts of different concrete classes, it was observed that all three layers worked jointly up to failure. The possibility of applying the plane-sections hypothesis in calculation has been evidently proved [2]. Moreover it is supposed that no normal and inclined cracks may appear under working loads. A choice of concrete quality as well as appropriate thickness of external layers is given by this requirement. But in accordance with the presently official standard procedures for reinforce concrete structure design, values of obviously calculated deflections of the three-layered beam elements are generally underestimated [4].

Even though design calculation of the standard reinforce concrete structures before cracking occurrence could be executed using obvious structural mechanic laws commonly applied for elastic solid. However, it is necessary to consider that cross section of reinforce concrete element is not more homogeneous. In addition to concrete, the layer structure consists of steel reinforcement with elasticity modulus several times higher than the concrete one. Due to this particularity, the section should be transformed to a fictive homogeneous concrete part. The reinforcement area in this transformation is replaced by equivalent concrete area depending on the ratio of reinforcement and concrete elasticity modulus. Similarly to this practice, it would be possible to substitute the multi-layer section consisting of different concrete strength by homogeneous beam section of higher strength concrete. But the layers should be rigidly connected together and act commonly like reinforcement in normal concrete.

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For I-beam section, a calculated model analogous to three-layer reinforced concrete structures could be also applied. The variations of time dependent ratio of elasticity modulus of external concrete layer to internal one are taken into account by reinforce concrete beam web thickness modification.

The particularity of I-beam calculation model of a three-layered section is a slender web and wide flanges. Significant differences of elasticity modulus of outside and inside layers can exist. Due this fact corresponding design formulas as well as rules might differ from usual reinforce concrete procedures.

3. Parametrical study based on the calculation model

The purpose of the following parametrical study was investigation of impacts of the high deformable inner layer, cast of low concrete strength on deflections of the overall three-layer structures. Three-layer beam specimens were 3000 mm long of rectangular section 160 mm large and 250 mm high. Both outside layers from structural concrete with modulus of elasticity of 15000 MPa were 40 mm thick. The height of the interior layer from varying modulus of lower concrete strength was 170 mm. Two reinforcement bars 8 mm in diameter were placed in the bottom exterior concrete layer. Reducing the initial value of inner layer, the concrete modular ratios under consideration in the study have varied from 1 to 150. In the case of usual one-layer rectangular section with span to height ratio $l/h > 10$, shear force effect on beam deflection may be neglected, because its value is substantially inferior to that produced by bending moment [4].

A part of deflection due to shear forces, transmitted mainly by the I-beam web is given by the the formula

$$f_V = \int_0^1 \frac{k \cdot V(x)}{G \cdot A} dx + C_V, \tag{1}$$

where:

C_V is an integral constant, its value is zero in the case of simply supported beam;

G – shear modulus of interior concrete layer;

k – correction factor depending on the shape and cross section dimensions, expressed by:

$$k = \frac{A}{I^2} \cdot \frac{S^2(z)}{b(z)} dz. \tag{2}$$

A – cross-sectional area,

I – second moment of area of section,

$S(z)$ – first moment of the area above the examined level,

$b(z)$ – width of section part at z level.

Section properties of actual three-layer reinforce concrete structure can be determined more easily for the ideal I-beam. In this case, the reinforcing steel area as well as the inner layer area should be transformed to the equivalent concrete area using modular ratio. The coefficient k consists of expression $\frac{S'(z)^2}{b_f}$ integrated trough the upper flange thickness, $\frac{S''(z)^2}{b_f}$ integrated trough the web height and $\frac{S'(z)^2}{b_f}$ in the limits of the lower flange thickness:

$$k = \frac{A}{I^2} \cdot \left\{ \int_{-y_{im}}^{-(y_{im}-h_f)} \frac{S'(z)^2}{b_f} dz + \int_{-(y_{im}-h_f)}^{h-y_{im}-h_f} \frac{S''(z)^2}{b_f} dz + \int_{h-y_{im}-h_f}^{(h-y_{im})} \frac{S''(z)^2}{b_f} dz \right\} = \frac{A}{I^2} \cdot (h-y_{im})^4 \cdot \frac{h_f \cdot b_f}{4} - \frac{(h-y_{im})^2 \cdot b_f}{6} \cdot$$

$$\cdot \left[(h-y_m)^3 - (h-y_{im}-h_f)^3 \right] + \frac{2}{b} \cdot b_f^2 \cdot h_f^2 \cdot \frac{b_f}{20} \cdot (h-y_{im}-0.5 \cdot h_f)^2 \cdot (h-y_{im}-h_f) + \frac{4}{3} \cdot h_f \cdot b_f \cdot (h-y_{im}-0.5 \cdot h_f) \cdot$$

$$(h-y_{im}-h_f)^3 + \frac{13}{30} \cdot b \cdot (h-y_{im}-h_f)^5 + \frac{h_f \cdot b_f}{4} \cdot y_{im}^4 - \frac{b_f}{6} y_{im}^4 \cdot \left[y_{im}^3 - (y_{im}-h_f)^3 \right] + \frac{b_f}{20} \cdot \left[y_{im}^5 - (y_{im}-h_f)^5 \right] +$$

$$+ \alpha \cdot A_S \cdot (y_{im}-a) \left\{ y_{im}^2 \cdot h_f - \frac{1}{3} \cdot \left[y_{im}^3 - (y_{im}-h_f)^3 \right] + \alpha \cdot A_S \cdot (y_{im}-a) \cdot \frac{h_f}{b_f} \right\}$$

However, generally the total structure deflection f_{tot} consists of component f_M produced by bending and additional part f_V induced by shear force. Each of them depends on the shape and cross section proportions. The successive changes of the modular ratio of outside and interior concrete layers during parametrical study discovered that the rectangular form of the cross-section could be modified into I-beam shape. Thus, it is more straightforward to calculate three-layer structural part deformations using the I-beam model. Influence of shear force impact on deflection may be more appropriately investigated, because it would be possible to deal with the thinner web of equivalent I-beams.

$S'(z)$ and $S'(z)$ – the first moment of area of the cut section part relating to the neutral axis within the limits of the I-beam flange;

α – the modular ratio of reinforcing steel E_s to concrete E_c in the transformed section;

A_s – the reinforcing steel area in the lower flange;

b, b_f – the width of the web/flange;

h, h_f – the height of the web/flange.

The deflections produced by shear forces are varying with value of correction factor k. They are increasing, when the transformed I-beam web thickness is becoming smaller. According to our calculation model, it means that concrete modular rations are growing.

While loading the single span beam by two identical concentrated forces, situated at the same distances from supports, the greatest shear deflection would be under load position. Its magnitude remains without changes in the region of pure bending. However, the extreme shear deflection is in the beam mid-span. Its amount can be calculated by usual structural mechanics procedures up to crack occurrences.

With growing ratios of elasticity modulus of concrete layers, the contribution of shear forces to deformations of resulting three-layer deflections are increasing significantly. For the modular ratio of outside and inner layers $E_{ex}/E_{in} = 100$, the shear force deflection would approximately equals to the value of deflection produced by bending. The common effect of shear forces is illustrated in Fig. 1. As it can be clearly seen, there is a strong growing tendency of shear forces to total deformations including bending moment contribution

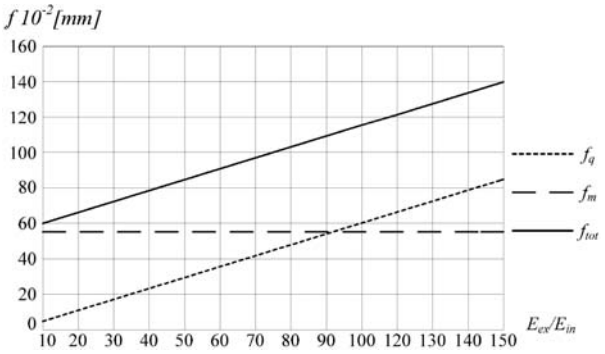

Fig. 1Effect of external and internal concrete modular ratio on whole and partial deflections

In the case of normal only one-layer structure, a part of deflection due to shear forces may be negligible, because it amounts only 1.5% of total deformation. However, this amount of deflections produced by bending and shear forces might vary significantly.

In the case of modular ratio of exterior to inside layers $E_{ex}/E_{in} = 130$, the shear deflection presents 56.4% and the bending one only 43.6% (see Fig. 2). For the structures with tightly joined layers, therefore the shear forces effect on deflections should be taken into account, because from ratio $E_{ex}/E_{in} > 130$ this contribution starts to be not negligible and amounts more than 10% of the total ˚deflection.

Design standard for concrete structures [4] expects to determine beam deflection before cracks initiation in the same way as for the solid body. For the transformed I- beam section, the following formula can be applied:

$$f_m = \frac{M}{\varphi_{c1} \cdot E_c \cdot I_{red}} \cdot \rho_m \cdot l^2 \qquad (3)$$

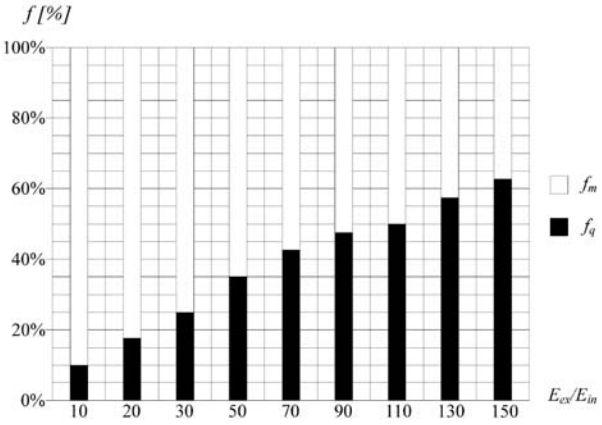

Fig. 2 Relationship between deformations produced by bending and shears effects for variable concrete modular ratio

where

M – bending moment in the exanimate section;

E_c – the initial elasticity module of external concrete layer;

I_{red} – second moment of area of transformed section;

φ_{c1} – correction factor taking into account short time concrete shrinkage effect;

ρ_m – coefficient depending on the loading scheme (for simply supported beam loaded by two symmetrically concentrated forces applied at the distances a from supports for instance

$$\rho_m = \frac{1}{8} - \frac{a^2}{6l^2}).$$

l – span of the beam.

The correction factors φ_{c1} vary from 0.85 to 0.7 depending on the concrete class and reinforce concrete structure type. Experimental results confirm that for three-layer structural parts, the calculated bending deflection should be increased by 15% due to shrinkage rheological effects.

The stiffness of three-layer structural elements in comparison with usual ones is reduced by shear deformation action. The additional deflection due this impact can be determined from the formula

$$f_V = \int_0^1 \overline{V}_x \cdot \gamma_x dx \qquad (4)$$

where

$\overline{V}_x$ – shear force in the exanimate point.

The factor γ_x of shearing deformation produced by a short time variable loading is given by expression

$$\gamma_x = \frac{1{,}5 \cdot V_x}{G \cdot b \cdot h_0} \qquad (5)$$

The resulting deflection of a reinforced concrete beam structure due to a short time live load would be:

$$f_V = \int_0^1 \frac{\overline{V}}{G} \cdot \frac{1{,}5 \cdot V}{b \cdot h_0} dx \qquad (6)$$

Calculation procedures of beam deflection produced by shear forces usually could ignore beam flanges contribution. In our numerical model, the flange effect might be important and shear force deflection value underestimated due to transformation of real three-layer structure to an ideal I-beam. Thus, it was necessary to examine these actions by special parametrical study of real structures.

Deformations of beams with uniformly distributed load 1 kN/m were calculated alternatively by two procedures. The first method was based on a transformed I-beam section as a calculation model and the second one took into account actual three-layer design concept of three-layer structure. The beam specimen's size was the same as in previous parametrical investigation. But outside layers with the concrete modulus 12000, 24000 and 48000 MPa were assumed. The interior concrete layer module varied from 600 MPa, which corresponds to the low thermally conductive lightweight concrete with unit mass 400 kg/m^3 to 30 MPa, i. e. 20 time minor.

Detail analysis of three-layer composite deformation can be found in [1]. Resulting bending deflection of three-layer reinforced concrete elements can be given as the following sum of bending deflection and shear force one:

$$f = \frac{5 \cdot q \cdot l^4}{384 \cdot B_{th}} \cdot \left\{ 1 + \frac{48 \cdot (1 - \lambda) \cdot k}{5 \cdot \pi^2} \cdot \left[1 - \frac{2}{u^2} + \frac{2 \cdot ch0}{u^2 \cdot chu} \right] \right\} \qquad (7)$$

where

q is beam uniformly distributed load;

l – beam span;

$\lambda = \dfrac{2 \cdot B_{ex}}{B_{in}}$;

$B_{ex} = \dfrac{E \cdot h_{ex}^3}{12}$ – bending stiffness of the outside layer;

$B_{th} = 2 \cdot \left[E \cdot h_{ex} \cdot \left(\dfrac{h_{in}}{2} + \dfrac{h_{ex}}{2} \right)^2 + B_{ex} \right]$ – bending stiffness of three-layered section;

h_{ex} – width of outside layer;

h_{in} –width of interior;

$k = \dfrac{\pi^2 \cdot E \cdot h_{ex}}{G_{in} \cdot l^2}$ – multiplier depending on shear modulus of interior concrete layer G_{in};

$u = 0.5 \cdot \pi \cdot \sqrt{\dfrac{1}{\lambda \cdot k}}$.

Parametrical analysis results are illustrated in Fig. 3. For actually existing modulus values of inside concrete layer, which are practically greater than 50 MPa, it can be concluded that deflections declared by calculation transforming real three-layer structure on fictive I-beam are very close to magnitudes provided by more complex procedure, considering real composition of the beam cross-sections. The differences are less than 1%. In addition, deflections only due to shear forces in the three layer model and I-beam model are also nearly the same, because the gaps are minor than 2%. Therefore, it is possible to use the I-beam design model for calculating the three-layer structures with modular ratios $50 \leq E_{ex}/E_{in} \leq 600$ with sufficient accuracy (see Fig. 3).

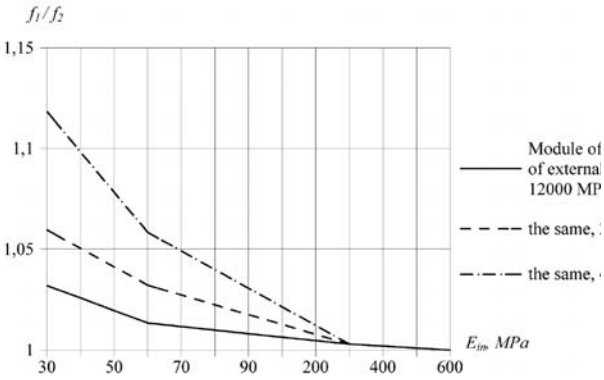

Fig. 3 Relationships between three-layer uniformly loaded elements´deflections for different modulus of inner concrete layer

4. Conclusion

The executed numerical and experimental investigations have demonstrated the possibility of application of the I-beam transformed system for the calculations of three-layer composite reinforce concrete elements. It should be taken into consideration that in the case of relatively small modulus of the interior layer, the main portion of the deflections is produced by the shearing action in beam web. Therefore both shearing and bending effects should be taken into account, while calculating three-layered reinforce composite concrete structures. Resulting deflection even for layered composite reinforce concrete elements before cracking development could be determined in the same way as for the bended I-beam section. The structural theory customary rules used in these calculations should be adjusted by means of correction multipliers identified experimentally and numerically in our investigation.

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2. Manuscripts written **in English language** must include **abstract** also written in English. The submission should not exceed **10 pages** with figures and tables (format A4, Times Roman size 12). The **abstract** should not exceed 10 lines.
3. Submissions should be sent: **by e-mail** (as attachment in application MS WORD) to one of the following addresses: *komunikacie@uniza.sk* or *holesa@uniza.sk* or *vrablova@uniza.sk* or *polednak@fsi.uniza.sk* **with a hard copy** (to be assessed by the editorial board) **or on a CD** with a hard copy to the following address: Zilinska univerzita, OVaV, Univerzitná 1, SK-010 26 Zilina, Slovakia.
4. Abbreviations, which are not common, must be used in full when mentioned for the first time.
5. Figures, graphs and diagrams, if not processed by Microsoft WORD, must be sent in electronic form (as GIF, JPG, TIFF, BMP files) or drawn in contrast on white paper, one copy enclosed. Photographs for publication must be either contrastive or on a slide.
6. References are to be marked either in the text or as footnotes numbered respectively. Numbers must be in square brackets. The list of references should follow the paper (according to **ISO 690**).
7. The author's exact **mailing address of the organisation where the author works, full names, e-mail address or fax or telephone number,** must be enclosed.
8. The editorial board will assess the submission in its following session. In the case that the article is accepted for future volumes, the board submits the manuscript to the editors for review and language correction. After reviewing and incorporating the editor's remarks, the final draft (before printing) will be sent to authors for final review and adjustment.
9. The deadlines for submissions are as follows: September 30, December 31, March 31 and June 30.

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